ACADEMIC REGULATIONS COURSE STRUCTURE

AND

DETAILED SYLLABUS

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

(Applicable for batches admitted from 2023-2024)

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY
(Autonomous)

Approved y AICTE, Permanently Affiliated to JNTUK,
NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified
Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

ACADEMIC REGULATIONS (R23) FOR B. TECH (REGULAR/HONORS/MINOR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2023-24 onwards

The B. Tech Degree of Jawaharlal Nehru Technological University Kakinada, Kakinada shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

VISION

Providing quality education to enable the generation of socially conscious software engineers who can contribute to the advancement in the field of Computer Science and Engineering (Artificial Intelligence and Machine Learning).

MISSION

- To equip the graduates with the knowledge and skills required to enable them to be industry ready.
- To train socially responsible, disciplined engineers who work with good leadership skills and can contribute for nation building.
- To make our graduates proficient in cutting edge technologies through student centric teaching-learning process and empower them to contribute significantly to the software industry
- To shape the department into a center of academic and research excellence

OBJECTIVES

- Equip the institute with state-of-the-art infrastructure comparable to the best in the industry.
- Tap the resources of the best minds in the field as faculty and visiting faculty.
- Groom students to become global entrepreneurs and responsible citizens.
- Provide financial assistance to meritorious students.
- Requisition the services of the best HR managers to place our students in reputed industries.
- Provide conducive atmosphere to the faculty for Research & Development and ensure active participation of the students.

About CSE (AIML) Department

- Department of CSE (AI&ML) was established in 2020 with an initial intake of 60 students, which has now increased to 180.

- Students of CSE (AI&ML) department are motivated to be innovative in their thinking while being strong in the Computer Science Core Knowledge.
- Graduates from our department are well-prepared to excel in industry, academia, and entrepreneurship, making a positive impact in the world of AI and ML
- Faculty of CSE (AI&ML) are always dedicated and devoted towards the comprehensive development of their students by training them physically through enough sports & games; psychologically through technical competitions globally.

Department Vision

- Providing quality education to enable the generation of socially conscious software engineers who can contribute to the advancement in the field of Computer Science and Engineering (Artificial Intelligence and Machine Learning).

Department Mission

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- To train socially responsible, disciplined engineers who work with good leadership skills and can contribute for nation building.
- To make our graduates proficient in cutting edge technologies through student centric teaching-learning process and empower them to contribute significantly to the software industry.
- To shape the department into a Centre of academic and research excellence.

1. Award of the Degree

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

(i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).

(ii) Registers for 160 credits and secures all 160 credits.

(b) Award of B.Tech. Degree with Honors

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

(i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. Programme i.e., 160 credits.

(ii) Registering for Honors is optional.

(iii) Honors is to be completed simultaneously with B.Tech. Programme.

2. Students who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission stands canceled. This clause shall be read along with clause 1 (a)(i).

3. Admissions

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications & specialization prescribed by the A.P. State Govt. / University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Govt. / University or any other order of merit approved by the A.P. Govt. / University, subject to reservations as prescribed by the Govt. /University from time to time.

4. Program related terms

Credit: A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

a) Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

b) Choice Based Credit System (CBCS): The CBCS provides a choice for students to

select from the prescribed courses.

5. Semester/Credits:

i) A semester comprises 90 working days and an academic year is divided into two semesters.
ii) The summer term is for 8 weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.
iii) Regular courses may also be offered during the summer on a fast-track mode to enable students to do additional courses or complete backlogs in coursework.
iv) The Universities/HEIs can decide on the courses to be offered in the summer term depending on the availability of faculty and the number of students.

6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities & Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. Course Classification

All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Core Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences, and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes subjects related to the discipline / department / branch of

			Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline / department / branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline / department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	Interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project &Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners

8. Programme Pattern

i. The total duration of the B. Tech (Regular) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. The minimum number of instruction days in each semester is 90 days.
iv. There shall be a mandatory student induction program for freshers, with three-week duration before the commencement of the first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
v. Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / **Community service activities** are made **mandatory as credit courses** for all the undergraduate students.
vi. Courses like Environmental Sciences, Indian Constitution, and Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
vii. Design Thinking for Innovation & Tinkering Labs is made mandatory as credit courses for all the undergraduate students.
viii. Increased flexibility for students through an increase in the elective component of the curriculum, with **05 Professional Elective** courses and **04 Open Elective** courses.
ix. Professional Elective Courses include the elective courses relevant to the chosen specialization/branch. Proper choice of **professional elective courses** can lead to students specializing in **emerging areas** within the chosen field of study.
x. A total of **04 Open Electives** are offered in the curriculum. A student can complete the

requirement for B.Tech. Degree with a **Minor within the 160 credits** by opting for the courses offered through various verticals/tracks under Open Electives.

xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be **05 skill-oriented** courses offered during **III to VII semesters**. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain / interdisciplinary courses and the other shall be a soft skills course.

xiii. Students shall undergo mandatory **summer internships**, for a minimum of **eight weeks duration** at the end of the **second and third year** of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

xiv. There shall also be mandatory **full internship** in the **final semester** of the programme along with the **project work**.

xv. An undergraduate degree with **Honors** is introduced for the students having good academic record.

xvi. Each department shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xvii. Each department shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth / placements / opportunities for higher studies /GATE/other competitive exams etc.

xviii. Preferably **25% of course work** for the **theory courses** in **every semester** shall be conducted in the **blended mode** of learning.

9. Evaluation Process

The performance of a student in each semester shall be evaluated **subject-wise** with a maximum of **100 marks** for **theory** and **100 marks** for **practical subject**. **Summer Internships** shall be evaluated for **50 marks**, **Full Internship & Project work** in **final semester** shall be evaluated for **200 marks**, and mandatory courses with no credits shall be evaluated for **30 mid semester marks**.

A student **must secure** not less than **35% of marks** in the **end examination** and a **minimum of 40% of marks** in the **sum of the mid semester and end examination marks** taken together for the theory, practical, design, drawing subject or project etc. In the case of a mandatory course, he/she should secure 40% of mid semester marks.

THEORY COUSES

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

i) For the theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

ii) For practical subjects, the distribution shall be 30 marks for the Internal Evaluation and 70 marks for the End Examination.

iii) If any subject has both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given the same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

a) Continuous Internal Evaluation

i) For theory subjects, during a semester, there shall be two mid-term examinations. The first midterm examination shall be conducted for the first two and half units of syllabus and the second midterm examination shall be conducted for the rest of the syllabus. Each **mid-term examination consists** of (i) one **online objective** examination (ii) one **descriptive** examination (iii) one **assignment** and (iv) one **Subject Seminar**.

The **online examination** (objective) shall be **10 marks** with duration of **20 minutes**, **descriptive examination** shall be for **10 marks** with a duration of **1 hour 30 minutes**, **assignment** test shall be **5 marks** with duration of **50 minutes** (Open book system with questions of L4 standard on Bloom's scale) and **Subject Seminar 5 marks**.

ii) The first **online** examination (objective) is set with **20 multiple choice questions for 10 marks** (20 questions x 1/2 marks) from first two and half units (50% of the syllabus).

iii) The first **descriptive examination** is set with **30 marks** (two questions for 12 marks and one question for 6 marks) with either or choice from first two and half units (50% of the syllabus), the student must answer all questions. The marks obtained in the subjective paper are condensed to 10 marks.

iv) The first **assignment Test** from first two and half units conducted for **20 Marks** and will be **scaled down to 5 Marks**. The test is an **open book** system, and the duration of the exam is **50 minutes**. Students can bring a maximum of three printed text books related to that subject. (Soft copies of the text books will not be allowed.) The assignments must provide broadened exposure to the course. The questions shall include problem solving approach, problem analysis & design, implementation, case studies etc.

v) For the first **subject seminar 5 marks**, each student shall be evaluated based on the presentation on any topic of his/her choice in the subject duly approved by the faculty member concerned.

In the **similar lines**, the **second mid** examinations shall be conducted on the rest of the syllabus. Any fraction in the total of mid marks shall be rounded off to the next higher mark.

vi) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid	: 25
Marks obtained in second mid	: 20
Final mid semester Marks	: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

For Example:

Marks obtained in first mid	: Absent
Marks obtained in second mid	: 25
Final mid semester Marks	: (0x0.2) + (25x0.8) = 20

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be **6 questions** and **all questions** are **compulsory**.

ii) **Question 1** shall contain **10 compulsory short answer questions** (2 short questions from each unit) for a total of **20 marks** such that **each question** carries **2 marks**.

iii) In each of the questions from **2 to 6**, there shall be **either/or type** questions of **10 marks each**. Students shall answer any one of them.

iv) The questions from **2 to 6** shall be set by covering one unit of the syllabus for each question.

Note: End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical &Electronics Engineering shall have the following pattern: **Question 1** shall contain **10 compulsory short answer questions** (Fist five Questions from first two and half units and last five questions from remaining syllabus). The questions numbers **2, 3, 4(a)** shall be set by covering from first two and half units and questions numbers **4(b), 5, 6** in the remaining syllabus.

PRACTICAL COURSES

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

a) For practical courses, there shall be a continuous evaluation during the semester for **30 internal marks** and the end examination shall be for **70 marks**.

b) **Day-to-day** work in the laboratory shall be evaluated for **15 marks** by the concerned laboratory teacher based on the regularity/record/viva and 15 marks for the internal test.

c) The end examination shall be evaluated for **70 marks**, conducted by the **concerned laboratory teacher** and a **senior expert** in the subject from the **same department**.

- Procedure: **20 marks**
- Experimental work & Results: **30 marks**
- Viva voce: **20 marks**.

d) For the subject having **design and/or drawing/graphics**, such as Engineering Drawing, the distribution of marks shall be **30 for mid semester** evaluation and **70 for end examination**.

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

Day-to-day work shall be evaluated for **15 marks** by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be **two midterm examinations** in a semester for duration of **2 hours** each for **15 marks** with weightage of **80% to better mid marks** and **20% for the other**. The first mid exam is set with **30 marks** (two questions for 12 marks and one question for 6 marks) with either or choice from first two and half units (50% of the syllabus), the student must answer all questions. The marks obtained in the subjective paper are condensed to 15 marks. The **second mid** examinations shall be conducted on the rest of the syllabus. Any fraction in the total of mid marks shall be rounded off to the next higher mark. Finalized mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

There shall be no objective paper in the mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final internal marks for the subject.

Note: In a practical subject consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the **end examination** shall be conducted for **70 marks** as a **single**

laboratory in **3 hours**. **Internal examination** shall be evaluated **30 marks** in **each part**. F**inal Internal marks** shall be arrived by considering the **average of marks obtained in two parts**.

The **end examination pattern for design and/or drawing/graphics** shall consist of **5 questions, either/or type**, of **14 marks each**. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc. is mentioned along with the syllabus.

e) There shall be **no external examination** for **mandatory courses** with **zero credits**. However, **attendance shall be considered** while calculating **aggregate attendance** and student shall be **declared to have passed** the mandatory course only when he/she secures a minimum of **40%** in the **internal examinations**. In case the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

f) The **laboratory records** and **mid semester test papers** shall be **preserved** for a **minimum of 3 years** in the **respective departments** as per the norms and shall be produced to the various committees as and when the same are asked for.

10. Skill Enhancement Courses

i) There shall be five skill-enhancement courses offered during III to VII semesters.

ii) Out of the **five skill courses two** shall be skill-enhanced courses from the **same domain**. Of the **remaining three** skill courses, **one shall** be a **soft skill course** and the **remaining two** shall be **skill-advanced courses** from the **same domain/Interdisciplinary/Job oriented**.

g) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 internal marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

iii) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.

iv) The student shall be given an option to choose either the skill courses being offered by the department or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded

to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the department to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

v) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the Head of the department.

11. Massive Open Online Courses (MOOCs)

A Student must pursue and complete **one course compulsorily** through MOOCs approved by the concerned department. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through **MOOCs for awarding the degree**. A student is **not permitted to register and pursue core courses** through MOOCs.

A student shall register for the course (**Minimum of either 8 weeks or 12 weeks**) offered through MOOCs with the **approval of Head of the Department**. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to **earn a certificate** by **passing the exam**. The student shall be **awarded the credits assigned** in the **curriculum** only by **submission of the certificate**. The **examination fee**, if any, **will be borne by the student**. Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for **credit transfer as specified** and **are exempted from appearing internal as well as external examination** (for the specified equivalent credit course only) **conducted by the college**.

Necessary amendments to the **rules and regulations** regarding adoption of **MOOC courses** would be proposed from time to time.

12. Credit Transfer Policy

Adoption of **MOOCs is mandatory**, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of **20% of the total courses** being offered in a particular programme i.e., maximum of **32 credits** through **MOOCs platform**.

i) The **college shall** offer credit mobility for MOOCs and give the **equivalent credit weightage to the students for the credits** earned through online learning courses.

ii) Student registration for the **MOOCs shall be** only through the **respective departments** and it is **mandatory** for the student to share **necessary information** with the **department**.

iii) The **credit transfer** policy will be **applicable** to the **Professional & Open Elective**

courses only.

iv) The **concerned department** shall **identify** the courses permitted for **credit transfer**.

v) The **department shall notify** at the **beginning of semester** the **list** of the online learning courses **eligible for credit transfer**.

vi) The department shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.

vii) The department shall ensure **no overlap of MOOC exams** with that of the **college examination schedule**. In case of **delay in results**, the college will **re-issue** the **marks sheet** for **such students**.

viii) Students **pursuing courses under MOOCs** shall acquire the required credits only after **successful completion** of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

ix) The **institution** shall **submit** the following to the **examination section of the university**:

- List of students **who have passed MOOC** courses in the **current semester** along with the **certificate of completion**.
- **Undertaking form** filled in by the students **for credit transfer**.

x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

13. Academic Bank of Credits (ABC)

The institution has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i) provide option of mobility for learners across the universities of their choice
ii) provide option to gain the credits through MOOCs from approved digital platforms.
iii) facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv) Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

14. Mandatory Internships Summer Internships

Two summer internships either **onsite or virtual**, each with a **minimum** of **08 weeks** duration, done at the **end of second and third years**, respectively are mandatory. It shall be completed in collaboration with **local industries, Govt. Organizations, construction agencies, Power projects, software MNCs** or any industries in the areas

of concerned specialization of the Undergraduate program. **One of the two summer internships** at the **end of second year** (**Community Service Project**) shall be **society oriented** and shall be completed in collaboration with government organizations/NGOs & others. The **other internship** at the **end of third year** is **Industry Internship** and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The **guidelines issued by the APSCHE / University** shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the **departmental committee**. A student will be required to **submit** a summer internship **report** to the concerned department and appear for an **oral presentation** before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The **report and the oral presentation** shall **carry 50% weightage each**. It shall be evaluated for **50 external marks**. There shall be **no internal marks** for Summer Internship. A student shall secure a **minimum of 40%** of marks for successful completion. In case a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the institution.

Full Semester Internship and Project work:

In the **final semester**, the student should **mandatorily register** and undergo internship (**onsite/virtual**) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship **completion certificate** and a **project report**. A student shall also be permitted to submit a project report on the work carried out during the internship.

The **project report** shall be **evaluated** by an **external examiner**. The total marks for project work are **200 marks** and distribution shall be **60 marks** for **internal** and **140 marks** for **external** evaluation. The **supervisor** assesses the student for **30 marks** (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental **Project Review Committee** consisting of supervisor, a senior faculty and HOD **for 30 marks**. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of an **internal examiner and external examiner** appointed by the University and is evaluated for **140 marks**.

The department shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

15. Guidelines for offering a Minor

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain a degree in Minor in another stream.

i) The **Minor program** requires the completion of **12 credits** in Minor stream chosen.

ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.

iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of **04 Open Electives** are offered in the curriculum. A student can complete the requirement for Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

16. Guidelines for offering Honors

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additional specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is the best choice for academically excellent students having a good academic record and interest towards higher studies and research.

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.

ii) A student shall earn an additional **15 credits** for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This **is in addition to the credits** essential for obtaining the Undergraduate degree in Major Discipline (i.e., **160** credits).

iii) A student is permitted to **register for Honors** in **IV semester after the results of III Semester** are declared and students may be allowed to take maximum two subjects per semester pertaining to the **Honors from V Semester onwards**.

iv) The Principal of the department shall arrange separate class work and timetable of the courses offered under Honors program.

v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.

vi) Students can complete the courses offered under **Honors either in the college** or in **online platforms** like SWAYAM with a **minimum duration** of **12 weeks for a 3-credit course and 8 weeks duration for a 2-credit** course satisfying the criteria for credit

mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.

vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.

viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.

ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. **No class/division** (i.e., second class, first class and distinction, etc.) **shall be awarded for Honors degree programme**.

x) If a **student drops** or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a **separate grade sheet mentioning** the additional courses completed by them.

xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For e.g., B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline

ii) The **enrolment** of students into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken **up to III semester** in case of regular entry students and **only III semester** in case of **lateral entry** students. Students having **7 CGPA without any backlog subjects** will be permitted to register for Honors.

iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.

v) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors

i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register for the courses under Honors.

ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of students pursuing the Honors.

iii) The students enrolled in the Honors courses will be monitored continuously. An

advisor/mentor from the parent department shall be assigned to a group of students to monitor the progress.

iv) There is no fee for registration of subjects for Honors program offered offline at the respective institutions.

17. Attendance Requirements:

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.

iii) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

iv) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.

v) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

vi) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

vii) For induction programme attendance shall be maintained as per AICTE norms.

18. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 17.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) up to in the subjects that have been studied up to III semester.

iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) in the subjects that have been studied up to V semester.

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations

and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such a case, he/she shall be in the academic regulations into which he/she is readmitted.

19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the % marks in the subject fall	Grade	Grade points Assigned
90 & above	S (Superior)	10
80 – 89	A (Excellent)	9
70 – 79	B (Very Good)	8
60 – 69	C (Good)	7
50 – 59	D (Average)	6
40 – 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$SGPA = \Sigma (C_i \times G_i)/\Sigma C_i$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$CGPA = \Sigma (C_i \times S_i) / \Sigma C_i$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured
First Class with distinction*	≥ 7.75 (Without any supplementary appearance)
First Class	≥ 7.75 (With any supplementary appearance) (or) ≥ 6.75 and < 7.75
Second Class	≥5.75 and <6.75
Pass Class	≥5 and <5.75
Fail	<5

***Note:** Students who have written supplementary examinations to fulfil the credit requirement will not be awarded First Class with Distinction. For such students the highest degree that is awarded will be First Class Only.

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

20. With–holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

21. Multiple Entry / Exit Option

(a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

(b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The HoD of the respective department shall forward such proposals submitted by the students to the Principal. An evaluation committee constituted by the Principal shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

23. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and

when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

24. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 days.

25. Medium of Instruction:

The medium of instruction of the entire B. Tech undergraduate programme in Engineering &Technology (including examinations and project reports) will be in English only.

26. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

27. General Instructions:

a. The academic regulations should be read as a whole for purpose of any interpretation.
b. Malpractices rules-nature and punishments are appended.
c. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
e. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
f. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

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ACADEMIC REGULATIONS (R23)
FOR B.TECH. (LATERAL ENTRY SCHEME)

*(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year **2024-2025** onwards)*

1. Award of the Degree

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

(i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).

(ii) Registers for 120 credits and secures all 120 credits.

(b) Award of B.Tech. degree with Honors

A student will be declared eligible for the award of the B.Tech. With Honors if he/she fulfils the following:

(i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. Programme i.e., 120 credits.

(ii) Registering for Honors is optional.

(iii) Honors is to be completed simultaneously with B.Tech. Programme.

2. Students who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission shall forfeit their seat.

3. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2

(i) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.

(ii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

And in case if student is already detained for want of credits for academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. Course Pattern

(i) The entire course of study is three academic years on semester pattern.

(ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

(iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

5. All other regulations applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

* * * *

MALPRACTICE RULES
DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No.	Nature of Malpractices/Improper conduct	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical and project work)

		already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the

	officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The

		candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

In case any emergency call Toll Free No. 1800 425 1288
LET US MAKE VVIT A RAGGING FREE CAMPUS

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B.TECH. - COURSE STRUCTURE – R23
(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	MC	2-0-2-0
3	Orientation to all branches career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch corresponding labs, tools, and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

COURSE STRUCTURE AND SYLLABUS

I B. TECH - I SEMESTER

SN	Course Code	Subjects	L/D	T	P	Credits
1	BS&H	Communicative English	2	0	0	2
2	BS&H	Engineering Physics	3	0	0	3
3	BS&H	Linear Algebra & Calculus	3	0	0	3
4	ES	Basic Civil & Mechanical Engineering	3	0	0	3
5	ES	Introduction to Programming	3	0	0	3
6	BS&H	Communicative English Lab	0	0	2	1
7	BS&H	Engineering Physics Lab	0	0	2	1
8	ES	Engineering Workshop	0	0	3	1.5
9	ES	Computer Programming Lab	0	0	3	1.5
10	BS&H	Health and wellness, Yoga, and sports	0	0	1	0.5
11	LS	Life Skills-I	2	0	0	0
Total Credits						**19.5**

I B. TECH - II SEMESTER

S. No	Course Code	Subjects	L/D	T	P	Credits
1	BS&H	Chemistry	3	0	0	3
2	BS&H	Differential Equations & Vector Calculus	3	0	0	3
3	ES	Basic Electrical and Electronics Engineering	3	0	0	3
4	ES	Engineering Graphics	1	0	4	3
5	ES	IT Workshop	0	0	2	1
6	PC	Data Structures	3	0	0	3
7	BS&H	Chemistry Lab	0	0	2	1
8	ES	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	PC	Data Structures Lab	0	0	3	1.5
10	BS & H	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
11	LS	Life Skills-II	2	0	0	0
		Total Credits				**20.5**

II B. TECH – I SEMESTER

S. No	Course Code	Subjects	L/ D	T	P	Credits
1	ES/BS	Probability & Statistics	3	0	0	3
2	BS & H	Universal Human Values 2- UnderstandingHarmony	2	1	0	3
3	ES	Artificial Intelligence	3	0	0	3
4	PC	Advanced Data Structures & Algorithms Analysis	3	0	0	3
5	PC	Object Oriented Programming Through Java	3	0	0	3
6	PC	Advanced Data Structures & Algorithms Lab	0	0	3	1.5
7	PC	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	SEC	Python programming	0	1	2	2
9	MC	Life Skills - III	1	0	0	-
		Total Credits				**20**

II B. TECH – II SEMESTER

S. No	Course Code	Subjects	L/ D	T	P	Credits
1	MC- I	Optimization Techniques	2	0	0	2
2	BS & H	Discrete Mathematics & Graph Theory	3	0	0	3
3	PC	Machine Learning	3	0	0	3
4	PC	Database Management Systems	3	0	0	3
5	PC	Digital Logic & Computer Organization	3	0	0	3
6	PC	Machine Learning Lab	0	0	3	1.5
7	PC	Database Management Systems Lab	0	0	3	1.5
8	SEC	Full Stack development -1	0	1	2	2
9	BS & H	Design Thinking & Innovation	1	0	2	2
10	AC	Environmental Science	2	0	0	-
11	MC	Life Skills - IV	1	0	0	-
		Total Credits				**21**

III B. TECH – I SEMESTER

S. No	Course Code	Subjects	L/D	T	P	Credits
1	PC12	Information Retrieval Systems	3	0	0	3
2	PC13	Computer Networks	3	0	0	3
3	PC14	Operating Systems	3	0	0	3
4	PE - I	1. Software Engineering 2. Cloud Computing 3. Internet of Things(IoT) 4. Exploratory Data Analysis with Python 5. Automata Theory & Compiler Design	2	0	2	3
5	OE-I	1. Entrepreneurship Development & Venture Creation 2. Management Sciences 3. Managerial Economics and Financial Accounting 4. Financial Literacy	3	0	0	3
6	PC15	Information Retrieval Lab	0	0	3	1.5
7	PC16	Computer Networks Lab	0	0	3	1.5
8	SEC	Full Stack Development -2 /SWAYAM Plus – Data Engineer / AI Engineer	0	1	2	2
9	ES	Tinkering Lab *(User Interface Design using Flutter)*	0	0	2	1
10	Evaluation of Community Service Internship		-	-	-	2
11	MC	Life Skills - V	1	0	0	-
		Total Credits				**23**
MC	Student may select from the same Minor Pool		3	0	3	4.5
MC	Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3

III B. TECH – II SEMESTER

S. No	Course Code	Subjects	L/D	T	P	Credits
1	PC17	Natural Language Processing	2	0	2	3
2	PC18	Deep Learning	3	0	0	3

3	PC19	Data Visualization	3	0	0	3
4	PE - II	1. Advanced Java Programming 2. Cryptography & Network Security 3. DevOps 4. Recommender Systems 5. 12-Week SWAYAM /NPTEL Course suggested by the BoS	2	0	2	3
5	PE - III	1. Software Project Management 2. Mobile Adhoc Networks 3. Computer Vision 4. NoSQL Databases 5. 12-Week SWAYAM /NPTEL Course suggested by the BoS	2	0	2	3
6	OE-II	1. Green Buildings 2. Computer Aided Design 3. Control Systems 4. Embedded Systems	3	0	0	3
7	PC20	Deep Learning Lab	0	0	3	1.5
8	PC21	Data Visualization Lab	0	0	3	1.5
9	SEC	Soft skills	0	1	2	2
10	AC	Technical Paper Writing & IPR	2	0	0	-
		Total Credits				**23**
	*Mandatory Industry Internship of 08 weeks duration during summer vacation					
MC	Student may select from the same minor's pool		3	0	3	4.5
HC	Student may select from the same honors pool		3	0	0	3

* Under Industry Internship interested students can pursue SWAYAM Plus courses viz., Hands-on Masterclass on Data Analytics OR Artificial Intelligence for Real-World Application

IV B. TECH – I SEMESTER

S. No	Course Code	Subjects	L/ D	T	P	Credits
1	PC22	Augmented Reality and Virtual Reality	2	0	2	3
2	MC-II	Human Resource Management				3
3	PE - IV	1. Responsible AI 2. Block Chain Technologies 3. AI in Healthcare 4. Quantum Computing 5. 12 week MOOC Swayam /NPTEL course recommended by the BoS	2	0	2	3

4	PE - V	1. Agile methodologies 2. Big Data Analytics 3. Reinforcement Learning 4. High Performance Computing 5. 12 week MOOC Swayam/NPTEL course recommended by the BoS	2	0	2	3
5	OE – III	1. Environmental Pollution Control 2. Unnamed Aerial Vehicles 3. Electrical Power Quality 4. Testing & Automation	3	0	0	3
6	OE – IV	1. Renewable Energy Technologies 2. Construction Technology 3. Energy Conservation and Auditing 4. IOT	3	0	0	3
7	SEC	Prompt Engineering / SWAYAM Plus - Certificate program in Prompt Engineering and ChatGPT	0	1	2	2
8	AC	Constitution of India	2	0	0	-
9	Internship	Evaluation of Industry Internship/Mini Project	-	-	-	2
		Total Credits				**22**
MC	Student may select from the same Minor's Pool		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3

IV B. TECH – II SEMESTER

S. No	Course Code	Subjects	L/D	T	P	Credits
1	Internship / Project Work	Full Semester Internship / Project Work	0	0	24	12
		Total Credits				**12**

Note: Student need to do at least ONE MOOC Course (3 credits out of 160 credits) to meet the mandatory requirement (11th criteria, as per R23 Regulations)

Open Electives, offered to other department students:

Open Elective I: Operating Systems / Computer Organization and Architecture
Open Elective II: Database Management Systems
Open Elective III: Object Oriented Programming Through Java
Open Elective IV: Computer Networks / Software Engineering / IOT Based Smart Systems

Minor Engineering

Note:

1. *To obtain Minor Engineering, student needs to obtain 18 credits by successfully completing any of the following courses in the concern stream.*
2. *During Minor/Honors Course selection, there should not be any overlapping with Regular/Major/OPEN Electives*

Minor in AI&ML

1. Database Management Systems 3-0-3-4.5 (II-II)
2. Operating Systems 3-0-0-3 (III-I)
3. Data Visualization 3-0-3-4.5 (III-II)
4. Generative AI 3-0-0-3 (IV-I)

Any of the following 12 Week 3 credit NPTEL MOOC Courses

1. Artificial Intelligence: Knowledge Representation and Reasoning
2. Machine Learning and Deep Learning - Fundamentals and Applications
3. Fundamentals of Object Oriented Programming
4. Discrete Mathematics for CS
5. Computer Networks and Internet Protocol
6. Software Engineering
7. Natural Language Processing
8. Business Intelligence & Analytics

Suggested MOOC Courses for Honors Degree in AI&ML

Note: ***To obtain Honor's degree, student needs to obtain 18 credits by successfully completing any of the following courses in the concern stream (without duplication).***

Mandatory Course(s)

1. Applied Linear Algebra in AI & ML 12 Week 3 Credit Course, MOOCS
2. Deep Learning for Natural Language Processing - 12 Week 3 Credit Course, MOOCS

Any of the following for remaining 12 Credits

3. High Performance Scientific Computing 12 Week 3 Credit Course, MOOCS
4. Computer Vision 12 Week 3 Credit Course, MOOCS
5. Applied Time-Series Analysis 12 Week 3 Credit Course, MOOCS
6. Reinforcement Learning 12 Week 3 Credit Course, MOOCS
7. GPU Architecture and Programming 12 Week 3 Credit Course, MOOCS
8. Computational Complexity 12 Week 3 Credit Course, MOOCS
9. Quantum Algorithms and Cryptography 12 Week 3 Credit Course, MOOCS
10. Practical High-Performance Computing 12 Week 3 Credit Course, MOOCS
11. Cryptography and Network Security 12 Week 3 Credit Course, MOOCS

FIRST YEAR COURSE STRUCTURE AND SYLLABUS

I B. TECH - I SEMESTER

SN	Course Code	Subjects	L/D	T	P	Credits
1	BS&H	Communicative English	2	0	0	2
2	BS&H	Engineering Physics	3	0	0	3
3	BS&H	Linear Algebra & Calculus	3	0	0	3
4	ES	Basic Civil & Mechanical Engineering	3	0	0	3
5	ES	Introduction to Programming	3	0	0	3
6	BS&H	Communicative English Lab	0	0	2	1
7	BS&H	Engineering Physics Lab	0	0	2	1
8	ES	Engineering Workshop	0	0	3	1.5
9	ES	Computer Programming Lab	0	0	3	1.5
10	BS&H	Health and wellness, Yoga, and sports	0	0	1	0.5
11	LS	Life Skills-I	2	0	0	0
Total Credits						**19.5**

I B. TECH - II SEMESTER

S. No	Course Code	Subjects	L/D	T	P	Credits
1	BS&H	Chemistry	3	0	0	3
2	BS&H	Differential Equations & Vector Calculus	3	0	0	3
3	ES	Basic Electrical and Electronics Engineering	3	0	0	3
4	ES	Engineering Graphics	1	0	4	3
5	ES	IT Workshop	0	0	2	1
6	PC	Data Structures	3	0	0	3
7	BS&H	Chemistry Lab	0	0	2	1
8	ES	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	PC	Data Structures Lab	0	0	3	1.5
10	BS & H	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
11	LS	Life Skills-II	2	0	0	0
		Total Credits				**20.5**

I B. TECH	COMMUNICATIVE ENGLISH	L	T	P	C
I SEMESTER		2	0	0	2

Course Objectives:

- To facilitate effective listening, speaking, reading, and writing skills among the students.
- To enhance the LSRW skills in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary.
- To help the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the context, topic, and pieces of specific information from social or transactional dialogues.
2. Apply grammatical structures to formulate sentences and correct word forms.
3. Analyze discourse markers to speak clearly on a specific topic in informal discussions.
4. Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
5. Create a coherent paragraph, essay, and resume.

UNIT - I

Lesson: **HUMAN VALUES: Gift of Magi (Short Story)**

Lesson: **"How to Fashion Your Own Brand of Success" by Howard Whitman**

Listening: Identifying the topic, the context, and specific pieces of information by listeningto short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies, and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces ofinformation.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT - II

Lesson: **NATURE: The Brook by Alfred Tennyson (Poem)**

Lesson: **"How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock**

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT - III
Lesson: **BIOGRAPHY: Elon Musk**
Lesson: **"How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz**
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT - IV
Lesson: **INSPIRATION: The Toys of Peace by Saki**
Lesson: **"How to Raise Your Self-Esteem and Develop Self-confidence" by James W Newman**
Listening: Making predictions while listening to conversations/transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes, or display complicated data.
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting Verbs, Direct & Indirect Speech, Active & Passive Voice
Vocabulary: Words often Confused, Jargons

UNIT - V
Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)
Lesson: "How to Eliminate Your Bad Habits" by Benjamin Franklin
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.
Grammar: Editing short texts identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

Text Books:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan 2023 (Units 1, 2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)
3. University of Success: OG Mandino Jaico Impression 2019 (5 Selected Lessons)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020.
2. Bailey, Stephen. Academic Writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

Grammar:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

Vocabulary:

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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I B.TECH	ENGINEERING PHYSICS	L	T	P	C
I SEMESTER		3	0	0	3

Course Objectives:

- To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Analyze the intensity variation of light due to polarization, interference and diffraction.
2. Familiarize with the basics of crystals and their structures.
3. Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
4. Summarize various types of polarization of dielectrics and classify the magnetic materials.
5. Explain the basic concepts of Quantum Mechanics and the band theory of solids.
6. Identify the type of semiconductor using Hall effect.

UNIT-I: WAVE OPTICS: Interference: Introduction – principle of superposition – interference of light – interference in thin films (Reflection geometry) & applications – colours in thin films – Newton's Rings, determination of wavelength and refractive index. **Diffraction:** Introduction – Fresnel and Fraunhofer diffractions – Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction grating - Dispersive power and resolving power of grating (Qualitative) **Polarization:** Introduction -Types of polarization - Polarization by reflection, refraction, and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT-II: CRYSTALLOGRAPHY AND X-RAY DIFFRACTION-Crystallography: Space lattice, Basis, Unit Cell & lattice parameters Bravais Lattices crystal systems (3D) coordination number packing fraction of SC, BCC & FCC Miller indices separation between successive (hkl) planes. **X-ray diffraction**: Bragg's law-X-ray Diffractometer–crystal structure determination by Laue's and powder methods

UNIT-III: DIELECTRIC AND MAGNETIC MATERIALS - Dielectric Materials: Introduction – dielectric polarization, dielectric polarizability, susceptibility, dielectric constant, and displacement vector – relation between the electric vectors – types of polarizations: electronic (Quantitative), ionic (Quantitative) and orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti's equation – complex dielectric constant – frequency dependence of polarization– dielectric loss. **Magnetic Materials:**

Introduction – magnetic dipole moment – magnetization – magnetic susceptibility and permeability – atomic origin of magnetism – classification of magnetic materials: Dia, para, ferro, anti-ferro & ferrimagnetic materials – domain concept for ferromagnetism & domain walls (Qualitative) – hysteresis – soft and hard magnetic materials.

UNIT-IV: QUANTUM MECHANICS AND FREE ELECTRON THEORY-Quantum Mechanics: Dual nature of matter – Heisenberg's uncertainty principle – significance and properties of wave function – Schrodinger's time independent and dependent wave equations – particle in a one-dimensional infinite potential well.**Free Electron Theory:** Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory-Fermi-Dirac distribution –Density of states -Fermi energy.

UNIT-V: SEMICONDUCTORS - Semiconductors: Formation of energy bands – classification of crystalline solids – Intrinsic semiconductors: Density of charge carriers – electrical conductivity – Fermi level – Extrinsic semiconductors: Density of charge carriers – dependence of Fermi energy on carrier concentration and temperature – drift and diffusion currents – Einstein's equation – Hall effect and its applications.

Text Books:

1. "Applied Physics" by T. Vijaya Krishna, T. Madhu Mohan, B. K. Pandey, Manoj K. Harbola, S. Chaturvedi - Cengage, 2020.
2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
3. Engineering Physics -D. K. Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Engineering Physics –Shatendra Sharma, Jyotsna Sharma, Pears on Education, 2018.
2. Engineering Physics"-Sanjay D.Jain, D.Sahasrabudhe and Girish, University Press.2010
3. Engineering Physics -M. R. Srinivasan, New Age international publishers (2009).
4. Fundamentals of Physics- Halliday, Resnick and Walker, Wiley (2006).
5. Physics for Scientists & Engineers, Serway and Jewett, Cengage (2019).

Web Resources:

1. https://www.loc.gov/rr/scitech/selected-internet/physics.html

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I B.TECH	LINEAR ALGEBRA AND CALCULUS	L	T	P	C
I/II SEMESTER	(ALL BRANCHES)	3	0	0	3

Course Objectives

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
2. Determine the eigenvalues and eigenvectors of a matrix or a linear transformation and using them to diagonalize a matrix.
3. Utilize mean value theorems to real life problems.
4. Familiarize with functions of several variables which is useful in optimization.
5. Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT-I: MATRICES: Rank of a matrix by Echelon form and normal form - Cauchy- Binet formulae (without proof) - Inverse of non-singular matrices by Gauss-Jordan method - System of linear equations: Solving system of homogeneous and non-homogeneous equations - Gauss elimination method, Jacobi and Gauss-Seidel iteration methods.

UNIT-II: EIGENVALUES, EIGENVECTORS & ORTHOGONAL TRANSFORMATION: Eigenvalues, Eigenvectors, and their properties - Diagonalization of a matrix - Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem - Quadratic form and nature of a quadratic form - Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-III: CALCULUS: Mean Value Theorems (without proofs): Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation - Cauchy's mean value theorem - Taylor's and Maclaurin's theorems with remainders - Problems and applications on the above theorems.

UNIT-IV: PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS): Functions of several variables: Continuity and Differentiability - Partial derivatives - Total derivatives - Chain rule - Taylor's and Maclaurin's series expansion of functions of two variables - Jacobians - Functional dependence - Maxima and minima of functions of two variables - Method of Lagrange's multipliers.

UNIT-V: MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS): Double integrals - Triple integrals - Change of order of integration - Change of variables to polar, cylindrical and spherical coordinates - Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition. Higher Engineering Mathematics, H. K. Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).

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I B.TECH	BASIC CIVIL AND MECHANICAL ENGINEERING	L	T	P	C
I SEMESTER		3	1	0	3

BASIC CIVIL ENGINEERING

Course Objectives:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions and introduction to basic civil engineering materials and construction techniques.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance, and storage of water.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society and understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
2. Know the concepts of surveying and to understand the measurement of distances, angles, and levels through surveying.
3. Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation and importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

UNIT-I: BASICS OF CIVIL ENGINEERING: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-Technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated Construction Techniques.

UNIT-II: SURVEYING: Objectives of Surveying- Horizontal Measurements- Angular Measurements-Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings - Contour mapping.

UNIT-IIIA: TRANSPORTATION ENGINEERING: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbor, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books:

1. M. S. Palanichamy, Basic Civil Engineering, McGraw Hill Education, 4th edition, 2017
2. S. S. Bhavikatti, Basic Civil Engineering, New Age International, 2010
3. Srikrishna A. Dhale and Kiran M. Tajne, Basics of Civil Engineering, 2014.

Reference Books:

1. G. Shanmugam and M. S. Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education, 2018.
2. S. Gopi, Basic Civil Engineering, Pearson, 2018
3. Introduction to Civil Engineering, Course Material, IIT Madras.

BASIC MECHANICAL ENGINEERING

Course objectives:

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes:

On successful completion of the course, students will be able to:

4. Understand the different manufacturing processes.
5. Demonstrate the working of different mechanical power transmission systems and Basics of robotics.
6. Understand the working principles of Various power plants.

UNIT-IIIB: INTRODUCTION TO MECHANICAL ENGINEERING: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **ENGINEERING MATERIALS:** Classification of Engineering materials &Their applications: Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials. Definition of Strength, Hardness, Ductility and Toughness

UNIT-IV: MANUFACTURING PROCESSES: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing. **MECHANICAL POWER TRANSMISSION**: Belt Drives, Chain, Rope drives, Gear Drives

and their applications. **INTRODUCTION TO ROBOTICS**: Joints & links, configurations, and applications of robotics

UNIT-V: POWER PLANTS: working principle of Steam, Diesel, Hydro, Nuclear power plants. **THERMAL ENGINEERING:** working principle of Boilers (Cochran boiler, Babcock and Wilcox boiler, La Mont boiler), Refrigeration cycle (Ideal Vapour Compression refrigeration cycle) and air-conditioning system (Summer air-conditioning system), IC engines, Otto cycle, Diesel cycle, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

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I B.TECH	INTRODUCTION TO PROGRAMMING	L	T	P	C
I SEMESTER	(COMMON TO ALL BRANCHES)	3	0	0	3

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand basics of computers, the concept of algorithm and algorithmic thinking.
2. Analyze a problem and develop an algorithm to solve it.
3. Implement various algorithms using the C programming language.
4. Understand more advanced features of C language.
5. Develop problem-solving skills and the ability to debug and optimize the code.

UNIT-I: INTRODUCTION TO PROGRAMMING AND PROBLEM SOLVING - Introduction: History of Computers, Basic organization of a computer: ALU, input-output units, memory. **Problem solving techniques:** Algorithmic approach, characteristics of algorithm, Algorithms, flowcharts (Using Dia Tool). **Introduction to Programming:** Languages & types, Basics of a Computer Program- basic structure of a C program, C Tokens – Literals, Primitive Data Types, Keywords, operators, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

UNIT-II: CONTROL STRUCTURES - Decision making: Simple sequential programs Conditional Statements (if, if-else, switch),
Iterative Statements: Loop - for, while, do-while, unconditional branching - break and continue.

UNIT-III: ARRAYS AND STRINGS - Arrays: indexing, memory model, programs with array of integers, two dimensional arrays**. Strings:** Introduction to Strings.

UNIT-IV
POINTERS & USER DEFINED DATA TYPES - Pointers: dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, Dynamic memory management. **User-defined data types:** Structures and Unions.

UNIT-V: FUNCTIONS & FILE HANDLING - Functions: Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables. **File Handling:** Basics of File Handling

Textbooks:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

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I B.TECH	COMPUTER PROGRAMMING LAB	L	T	P	C
I SEMESTER	(COMMON TO ALL BRANCHES)	0	0	3	1.5

Course Objectives

- The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Read, understand, and trace the execution of programs written in C language.
2. Select the right control structure for solving the problem.
3. Develop C programs which utilize memory efficiently using programming constructs like pointers.
4. Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

List of Experiments:

WEEK 1 Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

WEEK 2 Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3 Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

WEEK 4 Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.
Suggested Experiments/Activities:
Tutorial4: Operators and the precedence and as associativity:
Lab4: Simple computational problems using the operator' precedence and associativity
i) Evaluate the following expressions.
a. A+B*C+(D*E) + F*G
b. A/B*C-B+A*D/3
c. A+++B---A
d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5 Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".
Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab 5: Problems involving if-then-else structures.
i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6 Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.
Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops
Lab 6: Iterative problems e.g., the sum of series
i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome

v) Construct a pyramid of numbers

WEEK 7 Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8 Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

WEEK 9 Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 10 Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10: Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type

WEEK 11 Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12 Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13 Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.

ii) Demonstrate Dangling pointer problem using a C program.

iii) Write a C program to copy one string into another using pointer.

iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers

WEEK14 Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.

ii) Write a C program to write and read text into a binary file using fread() and fwrite()

iii) Copy the contents of one file to another file.

iv) Write a C program to merge two files into the third file using command-line arguments.

v) Find no. of lines, words and characters in a file

vi) Write a C program to print last n characters of a given file.

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

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I B. TECH	COMMUNICATIVE ENGLISH LAB	L	T	P	C
I SEMESTER		0	0	2	1

Course Objectives:

- To exposethe students to a variety of self-instructional, learner friendly modes of language learning.
- To train the students in basic communication skills and also make them ready to face job interviews.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
2. Apply communication skills through various language learning activities.
3. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
4. Evaluate and exhibit professionalism in participating in debates and group discussions.
5. Create effective career objectives.

List of Experiments:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover Letter, SOP
7. Group Discussions-Methods & Practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interview Skills

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press. 2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016.
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed),Kindle, 2013

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
1. https://www.youtube.com/c/EngLanguageClub/featured
2. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
3. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

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I B.TECH	ENGINEERING PHYSICS LAB	L	T	P	C
I SEMESTER		0	0	2	1

Course Objectives:

- To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Operate optical instruments like travelling microscope and spectrometer.
2. Estimate the wavelengths of different colours using diffraction grating.
3. Plot the intensity of the magnetic field of circular coil carrying current with distance.
4. Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
5. Calculate the band gap of a given semiconductor.
6. Identify the type of semiconductor using Hall Effect.

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photo electric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.

17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References:

1. A Textbook of Practical Physics-S. Balasubramanian, M. N. Srinivasan, S. Chand Publishers, 2017.

Web Resources:

1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

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I B.TECH	ENGINEERING WORKSHOP	L	T	P	C
I SEMESTER		0	0	3	1.5

Course objectives:

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes:

On successful completion of the course, students will be able to:

1. Identify workshop tools and their operational capabilities (KL1)
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding (KL2)
3. Apply fitting operations in various applications (KL3)
4. Apply basic electrical engineering knowledge for House Wiring Practice (KL3)

List of Experiments:

(Student has to complete Two experiments in each Trade)

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a) Half – Lap joint
   b) Mortise and Tenon joint
   c) Corner Dovetail joint or Bridlejoint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray
   b) Conical funnel
   c) Elbow pipe
   d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit
   b) Dovetail fit.
   c) Semi-circular fit
   d) Bicycle tire puncture and change oftwo-wheeler tyre
5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series
   b) Two-way switch
   c) Godown lighting
   d) Tube light

e) Threephase motor
f) Soldering of wires

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22

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I B.TECH	HEALTH AND WELLNESS, YOGA AND SPORTS	L	T	P	C
I SEMESTER		0	0	1	0.5

Course Objectives

- The main objective of introducing this course is to make the students maintain their mental andphysical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the importance of yoga and sports for Physical fitness and sound health.
2. Demonstrate an understanding of health-related fitness components.
3 Compare and contrast various activities that help enhance their health.
4. Assess current personal fitness levels.
5. Develop Positive Personality

UNIT- I: Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT- II: Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT- III: Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T. K. V. Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J. Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

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I B.TECH	LIFE SKILLS-I	L	T	P	C
I SEMESTER		2	0	0	0

Course Outcomes:

On successful completion of the course, students will be able to:

1. To convert difficult data into equations and find solution by various methods and means using Algebra.
2. Application of Number system usage in daily life.
3. Enhance the logical abilities on various series and analogies (number, letter and verbal).
4. Implementing logical classification, coding and decoding (number, letter and verbal).
5. Understand importance of effective communication ski, usage of contextual vocabulary and Understand the importance of grammar for effective communication.

The Life Skills course is divided into three components – Part-A. Quantitative Ability, Part-B. Reasoning Ability and Part-C. Verbal Ability.

Part-A: Quantitative Ability: Almost all competitive examinations test the candidate for quantitative aptitude, especially recruitment test, public service examinations management courses, where they evaluate the student's thinking prowess and analytical skills. Critical analysis of problems asked in examination reveal that they are designed to correlate multiple topics and the test taker is expected to identify those link points and come out with an out-of-box unique solution. The purpose of the test is to assess arithmetic abilities, logic, analysis, problem solving and decision-making skills.

Part-B: Reasoning Ability: Reasoning ability is the ability to draw connections between factors, and the ability to synthesize a message from a body of information. Reasoning ability of the aspirants for jobs or courses is tested by means of a verbal reasoning test non-verbal reasoning. Thus, reasoning is a highly specialized thinking which helps an individual to explore mentally the cause & effect relationship of an event or solution of a problem by adopting some well-organized systematic steps based on previous experience combined with present observation. Most of the recruitment tests consist of questions to assess the reasoning ability of the students.

Part-C: Verbal Ability: The dramatic changes in global economies have been matched with the transformation in technology and these have an impact on education as well the workplace. Life skills provide students with important skills such as independent thinking, social skills, situational awareness, and communication skills needed in the campus and future workplaces. They equip the student with the requisite tools for all round development, and the requisite non-academic skills to enrich their lives.

Part-A: Quantitative Ability

UNIT-I: Module 1: Linear equation or simple equation and Algebraic equation
Module 2: Number System – Prime Factorization, divisibility of a factorial number, number of zeroes, unit digit and remainders, Examples, and practice problems.

UNIT-II: Module 3: LCM AND HCF – Definitions of LCM and HCF, Methods of finding LCM and HCF using Prime Factorization method and Division Method, Examples, and practice problems.
Module 4: Ratio, proportion, and variation – Definition of Ratios and Proportions, Meaning of Ratios and Proportions, Properties of Ratios, Formulas, differences between Ratios and Proportions, Examples, and practice problems.

Part-B: Reasoning Ability

UNIT-III
Module 5: Series
Module 6: Analogy

UNIT-IV
Module 7: Classification
Module 8: Coding and Decoding

Part-C: Verbal Ability

UNIT-V
Module 5: Functional English; Ad-lib/ impromptu speaking sessions; JAM sessions
Module 6: Writing paragraphs (describing a process, reporting an incident, explaining an experience); Summarizing TED talks; and Letter Writing

UNIT-VI
Module 7: Time management; Stress Management; and Emotional intelligence
Module 8: Interpersonal skills; Team dynamics; and Leadership development

Reference Books

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta

6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. How to Prepare for Data Interpretation by Arun Sharma
8. Logical Reasoning Data Interpretation by Nishit K. Sinha
9. Analytical Reasoning (2018-2019) Session by MK Panday
10. How to Crack Test of Reasoning by Jaikishan and Premkishan [Arihant]
11. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
12. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
13. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGraw Hill]
14. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
15. Visual Intelligence for Beginners by Matthew Alcot
16. McCarthy, Michael& Felicity O'Dell. English Vocabulary in Use beginner, Cambridge University Press, 2017.
17. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Upper-Intermediate, Cambridge University Press, 2017.
18. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Advanced, Cambridge University Press, 2017.
19. Sonmez, John. Soft Skills: The Software Developer's Life, Manning Publications, 2014.
20. Tulgan, Bruce. Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent, Pan Macmillan India, 2016.

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I B.TECH	CHEMISTRY	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives:

- To familiarize engineering chemistry and its applications.
- To understand the significance of Schrodinger wave equation and molecular orbital theory
- To apply advanced materials for engineering applications.
- To train the students on the principles and applications of electrochemistry - batteries and fuel cells.
- To know the significance of polymers and composites (FRP's) in household appliances, aerospace, and automotive industries.
- To summarize the instrumental methods and their applications.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Apply the principles of quantum mechanics to solve the problems like particle in a one-dimensional box.
2. Demonstrate and distinguish the principle of Band diagrams in the application of semiconductors, conductors & superconductors.
3. Analyze the materials usage in construction of batteries, fuel cells and electrochemical sensors.
4. Synthesize some important polymers, analyze the properties and applications of thermosetting, thermoplastics, elastomers& conducting polymers.
5. Compare and apply the principles of spectroscopy, to elucidate the molecular structure and functional group analysis.

UNIT-I: STRUCTURE AND BONDING MODELS: Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT-II: MODERN ENGINEERING MATERIALS: Semiconductors – Introduction, Classification, intrinsic and extrinsic Si-semiconductors, applications. Super conductors-Introduction, Types of superconductors, Meissner effect applications. **Super capacitors:** Introduction, Basic Concept-Classification – Applications. **Nano materials:** Introduction, classification of nano-materials, properties and applications of Fullerenes, carbon nano tubes and Graphene nanoparticles.

UNIT-III: ELECTROCHEMISTRY AND APPLICATIONS: Electrochemical cell,

Nernst equation, Electrochemical series - significance, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations). Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, working of hydrogen-oxygen fuel cell–. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT-IV: POLYMER CHEMISTRY: Introduction to polymers, functionality of monomers, chain growth, step growth polymerization, and coordination polymerization, with specific examples and mechanisms of polymer formation. Plastics – Thermoplastics and Thermo-settings, Preparation, properties, and applications of – PVC, Teflon, Bakelite, Nylon-6, 6, carbon fibres (CFRP& GFRP). Elastomers–Buna-S, Buna-N–preparation, properties, and applications. Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polys Lactic Acid (PLA).

UNIT-V: INSTRUMENTAL METHODS AND APPLICATIONS: Types of electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law, UV-Visible Spectroscopy, types of electronic transitions, Applications of UV-Visible Spectroscopy IR spectroscopy: fundamental modes molecular vibrations and selection rules, functional group region, fingerprint region, Applications of IR- Spectroscopy, NMR spectroscopy-Basic Principle, Chemical shift, Instrumentation and Applications.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008'
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition.

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I B.TECH	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Solve the differential equations related to various engineering fields. (L3)
2. Solve the second and higher order differential equations and its applications. (L3)
3. Identify solution methods for partial differential equations that model physical processes. (L3)
4. Interpret the physical meaning of different operators such as gradient, curl and divergence. (L5)
5. Estimate the work done against a field, circulation and flux using vector calculus. (L5)

UNIT-I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST: Linear differential equations - Bernoulli's equations - Exact equations and equations reducible to exact form - Applications: Newton's law of cooling - Law of natural growth and decay - Electrical circuits.

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS): Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral - Wronskian, Method of variation of parameters - Simultaneous linear equations - Applications to L-C-R circuit problems and Simple harmonic motion.

UNIT-III: PARTIAL DIFFERENTIAL EQUATIONS: Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solutions of first order linear equations using Lagrange's method - Homogeneous linear partial differential equations with constant coefficients.

UNIT-IV: VECTOR DIFFERENTIATION: Scalar and vector point functions - Vector operator del - Del applied to scalar point functions - Gradient, Directional derivative - Del applied to vector point functions - Divergence and Curl - Vector identities.

UNIT-V: VECTOR INTEGRATION: Line integral - Circulation - Work done - Surface integral, flux - Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Volume integral - Gauss divergence theorem (without proof) and related problems.

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, Mc Graw Hill Education, 2017.

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I B.TECH	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Remember the basic electrical elements and different fundamental laws.
2. Understand the construction and operation of AC and DC machines, measuring instruments.
3. Understand the different power generation mechanisms, Electricity billing concept, important safety measures related to electrical operations & understand the basic operation of Semiconductor Devices.
4. Understand the operation of different electronics circuits.
5. Understand the Boolean Algebra theorems, simplify and design logic circuits and elements of sequential logic circuits.

UNIT-I: DC & AC CIRCUITS - DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems. **AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT-II: MACHINES AND MEASURING INSTRUMENTS - Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.
Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge. (Elementary Treatment only).

UNIT-IIIA: ENERGY RESOURCES, ELECTRICITY BILL, SAFETY MEASURES - Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation. **Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy,

two-part electricity tariff, calculation of electricity bill for domestic consumers. (Simple numerical problem) **Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

UNIT-IIIB: SEMICONDUCTOR DEVICES - Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier. (Elementary Treatment only)

UNIT-IV: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION - Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system. (Elementary Treatment only).

UNIT-V: DIGITAL ELECTRONICS - Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Grey code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)
Content Beyond the syllabus: Digital Multi-meters (Block diagram).

Text books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition.
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.
4. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
5. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.
5. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
6. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
7. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

e- Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

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I B.TECH	ENGINEERING GRAPHICS	L	T	P	C
II SEMESTER	(First angle projection only)	1	0	4	3

Course objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points and lines
- To improve the visualization skills for better understanding of plane surfaces and projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Orthographic projection.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Construct various engineering curves.
2. Apply the principle of orthographic projection to points and lines.
3. Understand and draw the projection of planes and solids inclined to both planes in first quadrant.
4. Use the knowledge of sectional views and Development of Solid Surfaces in Real time Applications.
5. Develop isometric drawings of simple objects reading the orthographic projections of those objects.

UNIT-I: INTRODUCTION: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. CURVES: construction of ellipse, parabola and hyperbola by general method (Eccentricity method), Cycloids, Involutes, Normal and tangent to Curves.

UNIT-II: ORTHOGRAPHIC PROJECTIONS: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants. PROJECTIONS OF STRAIGHT LINES: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane.
Projections of Straight Lines Inclined to both the reference planes, Midpoint problems.

UNIT-III: PROJECTIONS OF PLANES: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

PROJECTIONS OF SOLIDS: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT-IV: SECTIONS OF SOLIDS: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only**. DEVELOPMENT OF SURFACES:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone in **simple position only.**

UNIT-V: CONVERSION OF VIEWS: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views. COMPUTER GRAPHICS: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).

Learning Resources

Text books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.
4. AutoCAD 2018 Training Guide (English, Paperback, Sagar Linkan)

Websites:

1. https://www.autodesk.com.au/campaigns/autocad-tutorials
2. https://nptel.ac.in/courses/112104172

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I B.TECH	IT WORKSHOP	L	T	P	C
II SEMESTER		0	0	2	1

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Perform Hardware troubleshooting.
2. Understand Hardware components and inter dependencies.
3. Safeguard computer systems from viruses/worms.
4. Document/ Presentation preparation.
5. Perform calculations using spreadsheets.

List of Experiments:

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them. **Ex:** Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

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I B.TECH	DATA STRUCTURES	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Summarize the role of linear data structures in organizing and accessing data efficiently in algorithms.
2. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
3. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
4. Devise novel solutions to small scale programming challenges involving data structures such queues, deques.
5. Recognize scenarios where trees, hashing is advantageous, and design hash-based solutions for specific problems.

UNIT-I: INTRODUCTION TO LINEAR DATA STRUCTURES: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort **HASHING:** Introduction to Hashing, Hash Functions, Collision Resolution Techniques.

UNIT-II: LINKED LISTS: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, comparing arrays and linked lists, Applications of linked lists.

UNIT-III: STACKS: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

UNIT-IV: QUEUES: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc. **DEQUES:** Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT-V: TREES: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal. **GRAPHS:** Elementary Graph Operations, Graph Traversals, Minimum cost spanning tree Algorithms, Shortest paths algorithms.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching,and Graph Algorithms" by Robert Sedgewick.

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I B.TECH	CHEMISTRY LAB	L	T	P	C
II SEMESTER		0	0	2	1

Course Objectives:

- To verify the fundamental concepts with experiments

Course Outcomes:

On successful completion of the course, students will be able to:

1. Determine the cell constant and conductance of solutions.
2. Prepare advanced polymer Bakelite materials.
3. Measure the strength of an acid present in any given ample/specimen.
4. Estimate the amount of Vitamin-C present in soft drinks.
5. Verify Beer-Lambert's law.

List of Experiments:

1. Determination of Strength of an acid in Pb-Acid battery.
2. Determination of Hardness of a groundwater sample.
3. Conductometric titration of strong acid vs. strong base.
4. Conductometric titration of weak acid vs. strong base.
6. Determination of cell constant and conductance of solutions.
7. Potentiometry - determination of redox potentials and emfs.
8. pH metry/ pH metric titration of strong acid Vs strong base.
9. Preparation of a Bakelite.
10. Determine the strength of given KMnO4 by colorimetry (Verification of Lambert-Beer's law).
11. Estimation of Ferrous Iron by Dichrometry .
12. Estimation of Iron by Permanganometry.
13. Measurement of 10Dq by spectrophotometric method.
14. Wavelength measurement of sample through UV- Visible Spectroscopy.
15. Identification of simple organic compounds by IR.
16. Preparation of nanomaterials by precipitation method.
17. Estimation of Vitamin-C present in soft drink.

Note: A student can choose any 10 experiments from the above list.

Reference:

1. "Vogel's Quantitative Chemical Analysis 6th Edition "Pearson Publications by J. Mendham, R. C. Denney, J. D. Barnesand B. Sivasankar.

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I B.TECH	ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP	L	T	P	C
II SEMESTER		0	0	2	1

Preamble: Electrical and Electronics Engineering Workshop Lab provides the essential facilities to the students to augment their concepts about the fundamentals of Electrical and Electronics Engineering.

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.
- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Objectives:

- To understand the Electrical circuit design concept, operation of Electrical Machines and Transformer, control the speed of three phase induction motors, measurement of resistance, power, and power factor.
- To apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments.
- To analyze the various characteristics of electrical circuits, electrical machines and measuring instruments.
- To understand the usage of electronic measuring instruments.
- To Plot and discuss the characteristics of various electron devices.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Analyze the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer. (L2)
2. Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments, calculations for the measurement of resistance, power and power factor. (L3)
3. Analyze various characteristics of electrical circuits, electrical machines and measuring instruments. (L4)
4. Understand the usage of electronic measuring instruments. (L2)
5. Plot and discuss the characteristics of various electron devices. (L3)

List of Experiments

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Calculation of Electrical Energy for Domestic Premises

7. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
8. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
9. Implementation of half wave and full wave rectifiers
10. Plot Input & Output characteristics of BJT in CE and CB configurations
11. Frequency response of CE amplifier.
12. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.

List of Additional Experiments: Any of the two experiments are to be conducted.

1. Measurement of Earth Resistance using Megger.
2. Simulation of RC coupled amplifier with the design supplied
3. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs
4. Measurement of parameters of choke coil.

Text books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.

Reference books:

1. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013.
2. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.
3. R. P. Jain, Modern Digital Electronics, 4th Ed., Tata McGraw Hill, 2009
4. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

e- Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

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I B.TECH	DATA STRUCTURES LAB	L	T	P	C
II SEMESTER		0	0	3	1.5

Course Objectives:

- The course aims to strengthen the ability of the students to identify and apply the suitable datastructure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
2. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
3. Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
4. Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.
5. Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

List of Experiments:

Exercise 1: Array Manipulation

i) Write a program to reverse an array.
ii) C Programs to implement the Searching Techniques – Linear & Binary Search.
iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort.

Exercise 2: Hashing

i) Implement a hash table with collision resolution techniques.
ii) Write a program to implement a simple cache using hashing.

Exercise 3: Linked List Implementation

i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
iii) Solve problems involving linked list traversal and manipulation.

Exercise 4: Linked List Applications

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double-ended queue (deque) with essential operations.

Exercise 5: Double Linked List Implementation

i) Implement a doubly linked list and perform various operations to understand its properties and applications.
ii) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 6: Stack Operations

i) Implement a stack using arrays and linked lists.
ii) Write a program to evaluate a postfix expression using a stack.
iii) Implement a program to check for balanced parentheses using a stack.

Exercise 7: Queue Operations

i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
iii) Solve problems involving circular queues.

Exercise 8: Stack and Queue Applications

i) Use a stack to evaluate an infix expression and convert it to postfix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 9: Binary Search Tree

i) Implementing a BST using Linked List.
ii) Traversing of BST.

Exercise 10: Graphs

Write C programs for implementing the following graph traversal algorithms:
a) Depth first traversal
b) Breadth first traversal

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum

4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching,and Graph Algorithms by Robert Sedgewick.

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I B.TECH	NSS/NCC/SCOUTS &	L	T	P	C
II SEMESTER	GUIDES/COMMUNITY SERVICE	0	0	1	0.5

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork,social consciousness among the students and engaging them in selfless service.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the importance of discipline, character and service motto.
2. Solve some societal issues by applying acquired knowledge, facts, and techniques.
3. Explore human relationships by analyzing social problems.
4. Determine to extend their help for fellow beings & downtrodden people.
5. Develop leadership skills and civic responsibilities.

UNIT- I: ORIENTATION: General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, careerguidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT- II: NATURE & CAREACTIVITIES

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT- III: COMMUNITY SERVICEACTIVITIES

i) Conducting One Day Special Camp in a village contacting village-area leaders- Surveyin the village, identification of problems- helping them to solve via media- authorities-experts-etc
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS

iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering",McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

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I B.TECH	LIFE SKILLS-II	L	T	P	C
II SEMESTER		2	0	0	0

Course Outcomes:

On successful completion of the course, students will be able to:

1. Enhance application skills in Business Mathematics.
2. Implementation of Mathematical skills in Business.
3. To improve logical visualization and counting in series, analogies and classification (non-verbal reasoning).
4. Implementation of arrangement in circular and row form in daily life.
5. Appreciate the importance of job requisites and attaining them.
6. Recognize the importance of goal setting and building of a ethical, and personal value system.

Part-A: Quantitative Ability

UNIT I: Module 1: PERCENTAGE - Formula of percentages, Finding percentages, percentage differences, changes in percentages, computing table of percentages, fraction to percentage and vice versa, Examples and practice problems.

Module 2: PROFIT and LOSS

UNIT II

Module 3: DISCOUNT

Module 4: PARTNERSHIP

Part-B: Reasoning Ability

UNIT III

Module 5: Counting Figures

Module 6: Non-Verbal Reasoning

UNIT IV

Module 7: Finding Missing Terms

Module 8: Arrangements

Part-C: Verbal Ability

UNIT V: Module 9: Understanding professional communication; Contextual Usage of selected vocabulary; Contextual understanding of vocabulary in a paragraph.

Module 10: Parts of speech; Subject-verb agreement; Tenses

UNIT VI: Module 11: Introduction to employability /life skills; Career guidance; Personal grooming and projecting a positive self-image.

Module 12: Goal setting & Planning; Ethics, values & Attitude

Reference Books:

1. Quantitative Aptitude for Competitive Examination by Dr R S Agarwal
2. Fast Track Objective Arithmetic Paperback – 2018 by Rajesh Verma
3. Teach Yourself Quantitative Aptitude, by Arun Sharma
4. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar
5. Quantitative Aptitude for all Competitive Exam by Abhijit Gupta
6. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
7. Reasoning Ability for Competitive Examination by Dr R S Agarwal
8. A Modern Approach to Logical Reasoning (2019-20 Session) by R.S. Aggarwal [S. Chand]
9. How to Prepare for Logical Reasoning for CAT by Arun Sharma [McGraw Hill]
10. Multidimensional Reasoning by Mishra and Kumar Dr. Lal [Upkar's]
11. A Modern Approach to Verbal & Non-Verbal Reasoning (2019-20 Session) by R.S. Aggarwal [S. Chand]
12. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwali and Indu Sijwali [Arihant]
13. Analytical Reasoning (2018-2019 Session) by MK Panday
14. How to Crack Test of Reasoning by Jaikishan and Premkishan [Arihant]
15. Logical Reasoning and Data Interpretation for CAT & other MBA exams by K. Sinha Nishit [Pearson]
16. Reasoning for Competitive Exams by K. Sinha Nishit [Pearson]
17. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams by Disha Experts
18. Visual Intelligence for Beginners by Matthew Alcot
19. Logical Reasoning & Data Interpretation by Nishit K. Sinha
20. McCarthy, Michael& Felicity O'Dell. English Vocabulary in Use beginner, Cambridge University Press, 2017.
21. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Upper-Intermediate, Cambridge University Press, 2017.
22. McCarthy, Michael & Felicity O'Dell. English Vocabulary in Use Advanced, Cambridge University Press, 2017.
23. Sonmez, John. Soft Skills: The Software Developer's Life, Manning Publications, 2014.
24. Tulgan, Bruce. Bridging the Soft Skills Gap: How to Teach the Missing Basics to Today's Young Talent, Pan Macmillan India, 2016

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SECOND YEAR COURSE STRUCTURE AND SYLLABUS

II B. TECH – I SEMESTER

S. No	Course Code	Subjects	L/ D	T	P	Credits
1	ES/BS	Probability & Statistics	3	0	0	3
2	BS & H	Universal Human Values 2- UnderstandingHarmony	2	1	0	3
3	ES	Artificial Intelligence	3	0	0	3
4	PC	Advanced Data Structures & Algorithms Analysis	3	0	0	3
5	PC	Object Oriented Programming Through Java	3	0	0	3
6	PC	Advanced Data Structures & Algorithms Lab	0	0	3	1.5
7	PC	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	SEC	Python programming	0	1	2	2
9	MC	Life Skills - III	1	0	0	-
		Total Credits				**20**

II B. TECH – II SEMESTER

S. No	Course Code	Subjects	L/ D	T	P	Credits
1	MC- I	Optimization Techniques	2	0	0	2
2	BS & H	Discrete Mathematics & Graph Theory	3	0	0	3
3	PC	Machine Learning	3	0	0	3
4	PC	Database Management Systems	3	0	0	3
5	PC	Digital Logic & Computer Organization	3	0	0	3
6	PC	Machine Learning Lab	0	0	3	1.5
7	PC	Database Management Systems Lab	0	0	3	1.5
8	SEC	Full Stack development -1	0	1	2	2
9	BS & H	Design Thinking & Innovation	1	0	2	2
10	AC	Environmental Science	2	0	0	-
11	MC	Life Skills - IV	1	0	0	-
		Total Credits				**21**

II B.TECH	PROBABILITY & STATISTICS	L	T	P	C
I SEMESTER		3	0	0	3

Course objectives:

- To familiarize the students with the foundations of probability and statistical methods.
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

On successful completion of the course, students will be able to:

1. Classify the concepts of data science and its importance.
2. Illustrates the association of characteristics and through correlation and regression tools.
3. Define and distinguish the concepts of probability and their applications, using discrete and continuous probability distributions.
4. Design the components of a classical hypothesis test.
5. Infer the statistical inferential methods based on small and large sampling tests.

UNIT-I: DESCRIPTIVE STATISTICS AND METHODS FOR DATA SCIENCE: Data Science-Statistics Introduction-Population Vs Sample-Collection of data-primary and secondary Data-Types of variable: dependent and independent Categorical and Continuous Variables-Data Visualization-Measures of Central Tendency-Measures of Variability (spread or variance)-Skewness Kurtosis

UNIT-II: CORRELATION AND CURVE FITTING: Correlation-correlation Coefficient-Rank Correlation-Regression coefficient and properties-regression Lines-Multiple Regression-Method of least Squares-Straight Line-Parabola-Exponential-Power curves.

UNIT-III: PROBABILITY AND DISTRIBUTIONS: Probability-Conditional probability and Baye's theorem- Random variables -Discrete and Continuous Random Variables-Distribution Function-Mathematical Expectation and Variance-Binomial, Poisson, Uniform and Normal distributions.

UNIT-IV: SAMPLING THEORY: Introduction–Population and Samples-Sampling distribution of Means and Variance (definition only)-Central limit theorem (without proof)-Introduction to t, chi-square, F Distributions-Point and Interval estimations- Unbiased estimation-properties of good Estimator-Maximum error of estimate.

UNIT-V: TEST OF HYPOTHESIS: Introduction–Hypothesis-Null and Alternative Hypothesis-Type I and Type II Errors-Level of Significance-One tail and two-tail tests-Tests concerning one mean, two means, and proportions using Z test, Tests concerning one mean, two means using t test, also chi-square and F tests use for small samples. ANOVA.

Text Books:

1. Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012

Reference Books:

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
2. Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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II B.TECH	UNIVERSAL HUMAN VALUES 2-	L	T	P	C
I SEMESTER	UNDERSTANDINGHARMONY	2	1	0	3

Course Objective:

- The students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understanding the content and process for Value education.
2. Understanding the harmony in the human being, family, society and nature/existence
3. Apply the Strengthening of self-reflection.
4. Apply to All levels become sensitive to their commitment towards what they have understood (human values, human relationship and human society)
5. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

UNIT-I: COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION: Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

UNIT-III: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN RELATIONSHIP: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of

relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT-IV: **UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE:** Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-V: IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Online References:

1. https://nptel.ac.in/courses/109104068
2. https://fdp-si.aicte-india.org/5day_onlineUHV.php

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II B.TECH	ARTIFICIAL INTELLIGENCE	L	T	P	C
I SEMESTER		3	0	0	3

Course Objectives:

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. The student should be made to introduce the concepts of Expert Systems.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. To learn different knowledge representation techniques

Course Outcomes:

On successful completion of the course, students will be able to:

1. Define AI principles and agents to formulate problems effectively.
2. Apply search strategies and algorithms to find solutions efficiently.
3. Utilize knowledge representation techniques for effective reasoning.
4. Master logical reasoning and apply statistical learning methods.
5. Design and implement expert systems for domain-specific problem-solving.

UNIT-I: INTRODUCTION: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT-II: SEARCHING- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT-III: REPRESENTATION OF KNOWLEDGE: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and Dempster-Shafer theory.

UNIT-IV: LOGIC CONCEPTS: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT-V: EXPERT SYSTEMS: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Textbooks:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill

Reference Books:

1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

Online Learning Resources:

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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II B.TECH	ADVANCED DATA STRUCTURES &	L	T	P	C
I SEMESTER	ALGORITHM ANALYSIS	3	0	0	3

Course Objectives:

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

Course Outcomes:

On successful completion of the course, students will be able to:

1. Develop proficiency in implementing and managing advanced data structures like AVL trees and B-Trees, and understanding their applications.
2. Apply heap tree structures and graph traversal algorithms, and analyze divide and conquer strategies like Quick Sort, Merge Sort, Strassen's matrix multiplication, and Convex Hull problems.
3. Employ greedy and dynamic programming techniques to solve optimization problems such as job sequencing, knapsack problems, minimum cost spanning trees, shortest path algorithms, optimal binary search trees, string editing, and the travelling salesperson problem.
4. Utilize backtracking and branch-and-bound strategies to solve combinatorial problems such as the 8-Queens problem, sum of subsets, graph coloring, knapsack problem, and travelling salesperson problem.
5. Understand and analyze NP-Hard and NP-Complete problems, including their implications and applications in computer science.

UNIT-I: INTRODUCTION TO ALGORITHM ANALYSIS: Space and Time Complexity analysis, Asymptotic Notations. AVL Trees – Creation, Insertion, Deletion operations and Applications. B-Trees – Creation, Insertion, Deletion operations and Applications

UNIT-II: HEAP TREES (PRIORITY QUEUES): Min and Max Heaps, Operations and Applications. Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Bi-connected Components, applications. Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT-III: GREEDY METHOD: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths. Dynamic Programming: General Method, all pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT-IV: BACKTRACKING: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem. Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT-V: NP HARD AND NP COMPLETE PROBLEMS: Basic Concepts, Cook's theorem. NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP). NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

Textbooks:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2nd Edition University Press

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.

e-Resources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari, 1. Introduction to Algorithms (youtube.com)

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II B.TECH	OBJECT - ORIENTED PROGRAMMING THROUGH JAVA	L	T	P	C
I SEMESTER		3	0	0	3

Course Objectives:

1. To identify Java language components and how they work together in applications
2. To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. To understand how to design applications with threads in Java
5. To understand how to use Java APIs for program development

Course Outcomes:

On successful completion of the course, students will be able to:

1. Infer object-oriented programming concepts for problem solving
2. List Object oriented concepts through Java
3. Build class hierarchy for real word problems
4. Demonstrate Java Exceptions and I/O Streams
5. Develop multithreaded application programs and Explore Database connections with Java FX library

UNIT-I: OBJECT ORIENTED PROGRAMMING: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators. **Control Statements:** Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator? :, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT-II: CLASSES AND OBJECTS: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this. **Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters

in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static. **Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors. **String Handling in Java:** Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer

UNIT-III: INHERITANCE: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance. **Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations. **Packages and Java Library:** Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

UNIT-IV: EXCEPTION HANDLING: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions. **Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2) **Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

UNIT-V: JAVA 8 FEATURES: Lambda Expressions, functional Interfaces, Default Methods, Date and Time API. **Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Text Books:

1. The complete Reference Java, 11thedition, Herbert Schildt, TMH
2. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

1. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

e-Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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II B.TECH	ADVANCED DATA STRUCTURES &	L	T	P	C
I SEMESTER	ALGORITHM ANALYSIS LAB	0	0	3	1.5

Course Objectives:

- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

Course Outcomes:

On successful completion of the course, students will be able to:

1. Develop proficiency in implementing and managing advanced data structures like AVL trees, B-Trees, and Heap Trees to efficiently handle data operations.
2. Apply various algorithmic techniques including sorting, graph traversal, and optimization methods to solve complex computational problems.
3. Demonstrate the ability to apply algorithmic design strategies such as dynamic programming, greedy methods, and backtracking to tackle classic problems in computer science.

Experiments covering the Topics:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

List of Experiments:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
5. a) Adjacency Matrix b) Adjacency Lists
6. Write a program for finding the bi-connected components in a given graph.

7. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
8. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
9. Implement Job sequencing with deadlines using Greedy strategy.
10. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
11. Implement N-Queens Problem Using Backtracking.
12. Use Backtracking strategy to solve 0/1 Knapsack problem.
13. Implement Travelling Sales Person problem using Branch and Bound approach.

Reference Books:

1. Fundamentals of Data Structures in C++, Horowitz Ellis, Sahni Sartaj, Mehta, Dinesh, 2nd Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill

e-Resources:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

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II B.TECH	OBJECT-ORIENTED PROGRAMMING	L	T	P	C
I SEMESTER	THROUGH JAVA LAB	0	0	3	1.5

Course Objectives:

- Practice object oriented programming in Java programming language
- implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

Course Outcomes:

On successful completion of the course, students will be able to:

1. Develop programs for solving real world problems using java collection frame work
2. Develop and apply multithreaded programs in network applications
3. Develop GUI programs using swing controls and create Database connections with Java FX library

Experiments covering the Topics:

- OOP fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

List of Experiments:

Exercise – 1:

a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program implement method overloading.
c) Write a JAVA program to implement constructor.
d) Write a JAVA program to implement constructor overloading.

Exercise - 4

a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi-level Inheritance
c) Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5

a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
c) Write a JAVA program that implements Runtime polymorphism

Exercise - 6

a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses
c) Write a JAVA program for creation of Java Built-in Exceptions
d) Write a JAVA program for creation of User Defined Exception

Exercise - 7

a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)
b) Write a program illustrating **is Alive** and **join ()**
c) Write a Program illustrating Daemon Threads.
    a. Write a JAVA program Producer Consumer Problem

Exercise – 8

a) Write a JAVA program that import and use the user defined packages
b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

Exercise – 9

a) Write a java program that connects to a database using JDBC
b) Write a java program to connect to a database using JDBC and insert values into it.
c) Write a java program to connect to a database using JDBC and delete values from it

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II B.TECH	PYTHON PROGRAMMING	L	T	P	C
I SEMESTER	(SKILL ENHANCEMENT COURSE)	0	1	2	2

Course Objectives:

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Course Outcomes:

On successful completion of the course, students will be able to:

1. Analyze the fundamental concepts of python programming.
2. Make use of Python functions to facilitate code reuse and manipulate strings.
3. Apply the suitable data structures in python to solve the real time problems.
4. Experiment with commonly used operations involving File handling and object oriented programming in python.
5. Use different Python packages to implement Data Science applications

UNTI-I: HISTORY OF PYTHON: Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook. **Parts of Python Programming Language:** Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language. **Control Flow Statements:** if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II: FUNCTIONS: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings. **Lists**: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
    i. Addition ii. Insertion iii. slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III: DICTIONARIES: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.
Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

UNIT-IV: FILES: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules. **Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the

array.

22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V: INTRODUCTION TO DATA SCIENCE: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

23. Python program to check whether a JSON string contains complex object or not.
24. Python Program to demonstrate NumPy arrays creation using array () function.
25. Python program to demonstrate use of ndim, shape, size, dtype.
26. Python program to demonstrate basic slicing, integer and Boolean indexing.
27. Python program to find min, max, sum, cumulative sum of array
28. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    1. Apply head () function to the pandas data frame
    2. Perform various data selection operations on Data Frame
29. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

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II B.TECH	OPTIMIZATION TECHNIQUES	L	T	P	C
II SEMESTER		2	0	0	2

Course Objectives:

- To introduce fundamental optimization techniques, including zero-order and first-order methods, and their applications in solving mathematical optimization problems.
- To equip students with the knowledge and skills to build and evaluate linear regression and classification models using various metrics and techniques.
- To familiarize students with linear unsupervised learning methods, enabling them to analyze data using dimensionality reduction, clustering, and matrix factorization techniques.
- To provide a comprehensive understanding of neural networks, focusing on their architecture, optimization, and regularization strategies to solve nonlinear problems.
- To develop proficiency in designing and optimizing tree-based models for regression and classification tasks, leveraging advanced methods like gradient boosting and random forests.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate the ability to identify and apply zero-order and first-order optimization techniques to solve optimization problems
2. Develop linear regression and classification models, and *evaluate* their performance using appropriate quality metrics and techniques
3. Utilize linear unsupervised learning techniques to *extract* meaningful patterns from datasets.
4. Design neural network architectures and *implement* optimization strategies to address nonlinear problems.
5. Develop decision tree-based models and *optimize* their performance using advanced techniques

UNIT-I: ZERO-ORDER OPTIMIZATION TECHNIQUES: Introduction, The Zero-Order Optimality Condition, Global Optimization Methods, Local Optimization Methods, Random Search, Coordinate Search and Descent. **First-Order Optimization Techniques:** Introduction, The First-Order Optimality Condition, The Geometry of First-Order Taylor Series, Computing Gradients Efficiently, Gradient Descent.

UNIT-II: LINEAR REGRESSION: Introduction, Least Squares Linear Regression, Least Absolute Deviations, Regression Quality Metrics, Weighted Regression, Multi-Output Regression. **Linear Two-Class Classification:** Introduction, Logistic Regression and the Cross Entropy Cost, Logistic Regression.

UNIT-III: LINEAR UNSUPERVISED LEARNING: Introduction, Fixed Spanning Sets, Orthonormality, and Projections, The Linear Auto-encoder and Principal Component Analysis, K-Means Clustering, General Matrix Factorization Techniques.

UNIT-IV: FULLY CONNECTED NEURAL NETWORKS: Introduction, Fully Connected Neural Networks, Activation Functions, The Backpropagation Algorithm, Optimization of Neural Network Models, Batch Normalization, Cross-Validation via Early Stopping.

UNIT-V: TREE-BASED LEARNERS: Introduction, From Stumps to Deep Trees, Regression Trees, Classification Trees, Gradient Boosting, Random Forests.

Text Books:

1. Machine Learning Refined Foundations, Algorithms, and Applications, Jeremy Watt, Reza Borhani, Aggelos K. Katsaggelos.

Reference Books:

1. (Neural Information Processing series) Suvrit Sra, Sebastian Nowozin, Stephen J. Wright - Optimization for Machine Learning-The MIT Press (2011).

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II B.TECH	DISCRETE MATHEMATICS & GRAPH THEORY	L	T	P	C
II SEMESTER		3	0	0	3

Corse objectives:

- Master mathematical logic principles, including connectives, normal forms, and inference techniques in both statement and predicate calculus.
- Utilize the principle of inclusion-exclusion, pigeonhole principle, and functions, including compositions, inverses, and recursive functions.
- Grasp the properties of semi-groups, monoids, groups, and the concepts of homomorphism and isomorphism.
- Develop skills in enumerating combinations and permutations, applying binomial and multinomial theorems.
- Analyze graph theory concepts, including graph isomorphism, sub-graphs, trees, planar graphs, and graph algorithms.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Apply mathematical logic to solve problems.
2. Understand the concepts and perform the operations related to sets, relations and functions. Gain the conceptual background needed and identify structures of algebraic nature.
3. Apply basic counting techniques to solve combinatorial problems.
4. Formulate problems and solve recurrence relations.
5. Apply Graph Theory in solving computer science problems

UNIT-I: MATHEMATICAL LOGIC: Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT-II: SET THEORY: The Principle of Inclusion- Exclusion, Pigeon-hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT-III: ELEMENTARY COMBINATORICS: Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNIT-IV: RECURRENCE Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by

Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.

UNIT-V: GRAPHS: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs.

Text books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

e-Resources:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

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II B.TECH	MACHINE LEARNING	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the foundational concepts, paradigms, and stages of machine learning, including data acquisition and model evaluation.
2. Apply nearest neighbor-based models using various distance measures for classification and regression tasks.
3. Utilize decision tree-based models and understand the principles of the Bayes classifier for optimal classification.
4. Implement linear discriminants and advanced techniques like SVM and neural networks for classification and regression.
5. Perform various clustering techniques to partition and analyze data patterns effectively.

UNIT-I: INTRODUCTION TO MACHINE LEARNING: Evolution of Machine Learning, Paradigms for ML, learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT-II: NEAREST NEIGHBOR-BASED MODELS: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT-III: MODELS BASED ON DECISION TREES: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. **The Bayes Classifier:** Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification, Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT-IV: LINEAR DISCRIMINANTS FOR MACHINE LEARNING: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT-V: CLUSTERING: Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Text Books:

1. "Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. "Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
2. "Machine Learning in Action", Peter Harrington, Dream Tech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

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II B.TECH	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives:

- Introduce database management systems and to give a good formal foundation on the relational model of data & usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

On successful completion of the course, students will be able to:

1. To comprehend the basics of database systems and applications
2. To construct logical design of database and information retrieval
3. To demonstrate relational model practically (Structured Query Language)
4. To demonstrate and relate normalization for database design
5. To outline the necessity of transaction management, recovery management & indexing

UNIT-I: INTRODUCTION: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database. **Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT-II: RELATIONAL MODEL: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT-III: SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT-IV: SCHEMA REFINEMENT (NORMALIZATION): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency. Lossless join and dependency preserving decomposition, (1NF, 2NF & 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD,4th normal form(4NF), 5th Normal Form (5NF).

UNIT-V: TTRANSACTION CONCEPT: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. **Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing:

Text Books:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

Reference Books:

1. Introduction to Database Systems, 8thedition, C J Date, Pearson.
2. Database Management System, 6th ed., Ramez Elmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation & Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage.

e-Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

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II B.TECH	DIGITAL LOGIC & COMPUTER ORGANIZATION	L	T	P	C
II SEMESTER		3	0	0	3

Course Objectives:

- provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

Course Outcomes:

On successful completion of the course, students will be able to:

1. Explore Data Representation techniques
2. Explore basic structure of Computers
3. Summarize computer arithmetic and process organization
4. Infer memory organization techniques
5. Explore I/O organization techniques

UNIT-I: DATA REPRESENTATION: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes **Digital Logic Circuits-I:** Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT-II: DIGITAL LOGIC CIRCUITS-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters**. Basic Structure of Computers:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT-III: COMPUTER ARITHMETIC: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations**. Processor Organization:** Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT-IV: **THE MEMORY ORGANIZATION:** Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT-V: **INPUT/ OUTPUT ORGANIZATION:** Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Textbooks:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, SafwatZaky, 6th edition, McGraw Hill, 2023.
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education, 2018.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson, 2022.

Reference Books:

1. Computer Systems Architecture, M.Moris Mano, 3rdEdition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson, 2003.

e-Resources:

1. https://nptel.ac.in/courses/106/103/106103068/

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II B.TECH	MACHINE LEARNING LAB	L	T	P	C
II SEMESTER		0	0	3	1.5

Course Objectives:

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems and machine learning.
- To learn about computing central tendency measures and Data preprocessing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Develop skills to manipulate, clean, and analyze data using Pandas, including creating various data visualizations.
2. Implement and analyze Mean, Median, Variance, Standard Deviation, etc.
3. Apply and evaluate machine learning algorithms such as KNN, Decision Trees, Random Forests, Naïve Bayes, SVM, and K-means for classification, regression, and clustering tasks.

Software Required for ML: Python/R/Weka

List of Experiments:

1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
2. Apply the following Pre-processing techniques for a given dataset.
   i. Attribute selection
   ii. Handling Missing Values
   iii. Discretization
   iv. Elimination of Outliers
3. Apply KNN algorithm for classification and regression
4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
5. Demonstrate decision tree algorithm for a regression problem
6. Apply Random Forest algorithm for classification and regression
7. Demonstrate Naïve Bayes Classification algorithm.
8. Apply Support Vector algorithm for classification
9. Demonstrate simple linear regression algorithm for a regression problem
10. Apply Logistic regression algorithm for a classification problem
11. Demonstrate Multi-layer Perceptron algorithm for a classification problem

12. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.
13. Demonstrate the use of Fuzzy C-Means Clustering
14. Demonstrate the use of Expectation Maximization based clustering algorithm

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II B.TECH	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
II SEMESTER		0	0	3	1.5

Course Objectives

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers,

Course Outcomes:

On successful completion of the course, students will be able to:

1. To create database for user (Creation of Database)
2. To solve various SQL queries for user defined schemas
3. To generalize PL/ SQL blocks
4. To illustrate the usage of user defined packages

List of Experiments:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
    i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
    ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.

8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

Text Books:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

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II B.TECH	FULL STACK DEVELOPMENT – 1	L	T	P	C
II SEMESTER	(SKILL ENHANCEMENT COURSE)	0	1	2	2

Course Objectives:

The main objectives of the course are to

- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

List of Experiments:

1. Lists, Links and Images

a. Write a HTML program, to explain the working of lists.
   Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.
c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

- Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)
- Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).

- Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
- Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

3. HTML 5 and Cascading Style Sheets, Types of CSS

a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, , tags.
b. Write a HTML program, to embed audio and video into HTML web page.
c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

4. Selector forms

a. Write a program to apply different types of selector forms
   - Simple selector (element, id, class, group, universal)
   - Combinator selector (descendant, child, adjacent sibling, general sibling)
   - Pseudo-class selector
   - Pseudo-element selector
   - Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model

a. Write a program to demonstrate the various ways you can reference a color in CSS.
b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
c. Write a program using the following terms related to CSS font and text:
   i. font-size ii. font-weight iii. font-style
   iv. text-decoration v. text-transformation vi. text-alignment
d. Write a program, to explain the importance of CSS Box model using
   i. Content ii. Border iii. Margin iv. padding

6. Applying JavaScript - internal and external, I/O, Type Conversion

a. Write a program to embed internal and external JavaScript in a web page.
b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

7. JavaScript Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. JavaScript Conditional Statements and Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
b. Write a program to display week days using switch case.
c. Write a program to print 1 to 10 numbers using for, while and do-while loops.
d. Write aprogram to print data in object using for-in, for-each and for-of loops
e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]
f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

9. Javascript Functions and Events

a. Design a appropriate function should be called to display
   - Factorial of that number
   - Fibonacci series up to that number
   - Prime numbers up to that number
   - Is it palindrome or not
b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
   1. Factorial of that number
   2. Fibonacci series up to that number
   3. Prime numbers up to that number
   4. Is it palindrome or not
c. Write a program to validate the following fields in a registration page

i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
ii. Mobile (only numbers and length 10 digits)
iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Web Links:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

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II B.TECH	DESIGN THINKING & INNOVATION	L	T	P	C
II SEMESTER		2	0	0	2

Course Prerequisite: Being able to identify a problem and an interest to solve it. Nature to consider different opinions and a challenging spirit to experiment several times with prototypes. Readiness to accept change and be Adaptable.

Course Objectives:

- To get exposed to the basic concepts Design Thinking of Stanford Model
- To understand the basic concepts of Empathy and the process of sensitization.
- To introduce the basic concepts of ideation techniques (flaring & focusing)
- To familiarize the basic concepts of prototyping and testing.
- Bringing innovation into engineering outcomes and enhancing the mindset & skillset of the students
- To acquire and apply the required mindsets apart from having the skill sets to solve real world challenges.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Develop key skills like Critical thinking, Problem-solving, Collaboration, and Creativity.
2. View problems as Opportunities.
3. Empathize, sensitize and identify the problems.
4. Translate an innovative idea to a prototype.
5. Apply Design Thinking Principles to develop human centric solutions (products, strategies, methodologies, services).

UNIT-I: INTRODUCTION TO DESIGN THINKING: What is Design thinking really? Introduction, Design thinking in Organization. Setting stage for design thinking in Management Education, Establishing the Design thinking essentials, DT process – Understanding Environment.

UNIT-II: EMPATHY, DEFINE & IDEATE: Understanding the stakeholder's perspective – Empathy, Defining the point of view – problem articulation, Ideation. Example Case studies.

UNIT-III: PROTOTYPING: Creating the prototype – Types of prototyping, pointers for effective prototyping, CEP, CFP, Dark horse, Funky, Vision, Functional, Finished, Final Prototype, critical elements of a service blue print, MVP.

UNIT-IV: TESTING & REFECTION: Testing – Introduction, testing phase, Tools for the testing phase. Reflections – Introduction, Tools used for Reflection, Conclusion. Execution –

Introduction, Implementation Phase Business Model and Canvas and Lean Canvas. Scaling up and Growth.

UNIT-V: INNOVATION: Innovation, Types of Innovation – Product Innovation, Process Innovation, Continuous Innovation, Sustaining Innovation, Business Innovation, Radical Innovation. Examples.

Text Books:

1. Design Thinking – a comprehensive text book, WILEY Publications, Shalini Rahul Tiwari.
2. "Introduction to Life Skills Education"- NCERT Training Package
3. "Change by Design" – Tim Brown

Reference Books:

1. "Design Thinking: Understanding How Designers Think & Work"-by Nigel Cross
2. A Field Guide to Human Centric Design – IDEO.org
4. Make Space – Scott Doorley and Scott Witthoft
5. Lean Startup – Eric Ries
6. Creative Confidence: Unleashing the Creative Potential Within Us All, David Kelley (d.school Founder) and Tom Kelley
7. The Achievement Habit – Bernie Roth (d.school Founder)
8. The art of innovation – Tom Kelley
9. The Ten Faces of Innovation – Tom Kelley

Web Resource:

1. https://online.stanford.edu/understanding-different-types-innovation-heart-change

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II B.TECH	ENVIRONMENTAL SCIENCE	L	T	P	C
II SEMESTER		2	0	0	-

Course Objectives:

To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Able to Understand The concepts of the ecosystem
2. Able to Understand The natural resources and their importance
3. Able to learn The biodiversity of India and the threats to biodiversity, and Apply conservation practices
4. Able to learn Various attributes of the pollution and their impacts
5. Able to Understand Social issues both rural and urban environment
6. Able to Understand About Environmental Impact assessment and Evaluate the stages involved in EIA

UNIT-I: MULTI-DISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, Scope and Importance – Need for Public Awareness. **NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT-II: ECOSYSTEMS, BIODIVERSITY, AND ITS CONSERVATION: ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III: ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT:
ENVIRONMENTAL POLLUTION: Definition, Cause, effects & control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT-IV: SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT-V: HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.
FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

References:

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

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THIRD YEAR COURSE STRUCTURE AND SYLLABUS
III B. TECH – I SEMESTER

S. No	Course Code	Subjects	L/D	T	P	Credits
1	PC12	Information Retrieval Systems	3	0	0	3
2	PC13	Computer Networks	3	0	0	3
3	PC14	Operating Systems	3	0	0	3
4	PE - I	1. Software Engineering 2. Cloud Computing 3. Internet of Things(IoT) 4. Exploratory Data Analysis with Python 5. Automata Theory & Compiler Design	2	0	2	3
5	OE-I	1. Entrepreneurship Development & Venture Creation 2. Management Sciences 3. Managerial Economics and Financial Accounting 4. Financial Literacy	3	0	0	3
6	PC15	Information Retrieval Lab	0	0	3	1.5
7	PC16	Computer Networks Lab	0	0	3	1.5
8	SEC	Full Stack Development -2 /SWAYAM Plus – Data Engineer / AI Engineer	0	1	2	2
9	ES	Tinkering Lab *(User Interface Design using Flutter)*	0	0	2	1
10	Evaluation of Community Service Internship		-	-	-	2
11	MC	Life Skills - V	1	0	0	-
		Total Credits				**23**
MC	Student may select from the same Minor Pool		3	0	3	4.5
MC	Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3

III B. TECH – II SEMESTER

S. No	Course Code	Subjects	L/D	T	P	Credits
1	PC17	Natural Language Processing	2	0	2	3

2	PC18	Deep Learning	3	0	0	3
3	PC19	Data Visualization	3	0	0	3
4	PE - II	1. Advanced Java Programming 2. Cryptography & Network Security 3. DevOps 4. Recommender Systems 5. 12-Week SWAYAM /NPTEL Course suggested by the BoS	2	0	2	3
5	PE - III	1. Software Project Management 2. Mobile Adhoc Networks 3. Computer Vision 4. NoSQL Databases 5. 12-Week SWAYAM /NPTEL Course suggested by the BoS	2	0	2	3
6	OE-II	1. Green Buildings 2. Computer Aided Design 3. Control Systems 4. Embedded Systems	3	0	0	3
7	PC20	Deep Learning Lab	0	0	3	1.5
8	PC21	Data Visualization Lab	0	0	3	1.5
9	SEC	Soft skills	0	1	2	2
10	AC	Technical Paper Writing & IPR	2	0	0	-
		Total Credits				**23**
	*Mandatory Industry Internship of 08 weeks duration during summer vacation					
MC	Student may select from the same minor's pool		3	0	3	4.5
HC	Student may select from the same honors pool		3	0	0	3

* Under Industry Internship interested students can pursue SWAYAM Plus courses viz., Hands-on Masterclass on Data Analytics OR Artificial Intelligence for Real-World Application

III B.TECH	INFORMATION RETRIEVAL SYSTEMS	L	T	P	C
I SEMESTER		3	0	0	3

Course Objectives:

- Understand the fundamental concepts, data structures, and algorithms related to Information Retrieval (IR) systems.
- Analyze and implement various indexing techniques such as inverted files, signature files, and PAT trees for efficient text retrieval.
- Evaluate different string searching and stemming algorithms and their applications in text processing and thesaurus construction.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Recall key terminology and basic data structures used in information retrieval.
2. Explain the working principles of inverted files, signature files, and lexical analysis techniques such as stoplists.
3. Apply appropriate algorithms to construct PAT trees and implement efficient string searching methods like Knuth-Morris-Pratt and Boyer-Moore algorithms.
4. Analyze and compare stemming algorithms and evaluate their effectiveness in compressing inverted files.
5. Design and develop a basic thesaurus by merging existing ones and applying text-based thesaurus construction techniques.

UNIT I: INTRODUCTION TO INFORMATION STORAGE AND RETRIEVAL SYSTEMS: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation **Introduction to Data structures and algorithms related to Information Retrieval**: Basic Concepts, Data structures, Algorithms.

UNIT II: INVERTED FILES AND SIGNATURE FILES: Introduction, sStructures used in Inverted Files, building an Inverted file using a sorted array, Modifications to the Basic Techniques. **Signature Files:** Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT III: NEW INDICES FOR TEXT, LEXICAL ANALYSIS AND STOPLISTS: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Stoplists.

UNIT IV: STEMMING ALGORITHMS AND THESAURUS CONSTRUCTION: Types of Stemming algorithms, Experimental Evaluations of Stemming, stemming to Compress Inverted Files. **Thesaurus Construction**: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

UNIT V: STRING SEARCHING ALGORITHMS: Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

Text Books

1. Modern Information Retrieval,Ricardo Baeza-Yates, Neto, PEA,2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.

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III B.TECH	COMPUTER NETWORKS	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Basic Computer Knowledge – Hardware, software fundamentals, Networking Basics – Understanding of networks, devices, and communication.

Course Objectives:

- To understand the different types of networks
- To develop an understanding, the principles of computer networks.
- To familiarize with Reference model OSI and TCP/IP
- To understand various layers of Reference models functions
- To explore network protocols

Course Outcomes:

On successful completion of the course, students will be able to:

1. Explain OSI and TCP/IP reference models and Example networks, characteristics of Transmission media and classify multiplexing techniques.
2. Apply the principles of data link layer design, including error detection and correction and implement basic and sliding window protocols to ensure reliable data transmission in network communication.
3. Analyze channel allocation and access protocols, and evaluate IEEE LAN and wireless Technologies like WLAN and Bluetooth in shared networks.
4. Compute optimal path using Routing Algorithms.
5. Illustrate the working of various application layer protocols.

UNIT-I: INTRODUCTION TO COMPUTER NETWORKS AND PHYSICAL LAYER: Uses of Computer Networks, Network Topologies, WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model -A Comparison of the OSI and TCP/IP Reference Models, Example Networks **Physical Layer:** Fourier analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel, Guided and Un Guided Transmission Media, Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing.

UNIT-II: DATA LINK LAYER: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Control Protocols, Sliding Window Protocols, Examples of Data Link Control Protocols.

UNIT-III: MEDIUM ACCESS CONTROL SUB LAYER: Channel Allocation problem, Multiple Access Protocols, IEEE standards for Local Area Networks, WLAN, Bluetooth.

UNIT-IV: NETWORK LAYER: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Internet Protocol Header, IP Addresses, subnetting and super netting.

UNIT-V: TRANSPORT & APPLICATION LAYER: Transport Layer Design Issues, Elements of Transport Protocols, The Internet Transport Protocols-Transmission Control Protocols and User Datagram Protocols. **Application Layer:** Application Layer Design Issues, Domain Name Systems, Electronic Mail, The World Wide Web, HTTP/HTTPS, FTP.

Text Books:

1. “Computer Networks”, Andrew Tanenbaum, Nick Feamster, David Wetherall, Global Edition, Publisher: Pearson, Year: 2021, ISBN: 9781292374062
2. “Data Communications and Networking with TCP/IP Protocol Suite”, Author(s): Behrouz A. Forouzan, Publisher: McGraw-Hill, Year: 2022, ISBN: 9781260597820.

References:

1. "Computer Networking: A Top-Down Approach", Author(s): James W. Kurose, Keith W. Ross, Publisher: Pearson, Year: 2021, ISBN: 9780135928523.
2. "An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network", Author(s): S. Keshav, Publisher: Addison-Wesley, Year: 1997, ISBN: 0201634422
3. "Internetworking with TCP/IP Volume 1", Author(s): Comer, Douglas, Series: Always learning, Publisher: Pearson Education Limited, Year: 2014, ISBN: 9781292056234.

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III B.TECH	OPERATING SYSTEMS	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Programming fundamentals, Computer Organization

Course Objectives:

- understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and protection.
- Make use of process scheduling algorithms and synchronization techniques to achieve better system performance.
- Illustrate different conditions for deadlocks and their possible solutions.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Summarize various basic features of different operating systems
2. Analyze process scheduling in OS
3. Outline various concurrency control techniques
4. Infer various memory management techniques
5. Summarize various file systems and protection techniques

UNIT-I: OPERATING SYSTEMS OVERVIEW: Introduction, operating system functions, operating system operations, Computing environments, Free and Open-Source Operating Systems. **System Structures:** Operating System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, Operating System Structure, Building and Booting an Operating System, Operating System Debugging.

UNIT-II: PROCESSES: Process Concept, Process Scheduling, Operations on Processes, Inter-Process Communication. **Threads and Concurrency:** Multithreading Models, Thread Libraries, Threading Issues. **CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling.

UNIT-III: SYNCHRONIZATION TOOLS: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization. **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-IV: MEMORY-MANAGEMENT STRATEGIES: Introduction, Contiguous Memory Allocation, Paging, Structure of the Page Table, Swapping. **Virtual Memory Management:** Introduction, Demand Paging, Copy-on-Write, Page Replacement, Allocation

of Frames, Thrashing. **Storage Management:** Overview of Mass Storage Structure, HDD Scheduling.

UNIT-V: FILE SYSTEM: File System Interface, File Concept, Access Methods, Directory Structure. File System Implementation: File-System Structure, File-System Operations, Directory Implementation, Allocation Methods, Free Space Management. **File-System Internals:** File-System Mounting, Partitions and Mounting, File Sharing. **Protection:** Goals of Protection, Principles of Protection, Protection Rings, Domain of Protection, Access Matrix.

Text Books:

1. Operating System Concepts, Silberschatz A, Galvin PB, Gagne G, 10th Edition, Wiley, 2018.

Reference Books:

1. Operating Systems - Internals and Design Principles, Stallings W, 9th Edition, Pearson, 2018, ISBN-10: 0-13-467095-7.
2. Operating Systems: A Concept-Based Approach, D. M. Dhamdhere, 3rd Edition, McGraw-Hill, 2013, ISBN-13: 978-0072957693.

e-Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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III B.TECH	SOFTWARE ENGINEERING	L	T	P	C
I SEMESTER		2	0	2	3

Course Objectives:

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation &verification procedures.

Course Outcomes:

On successful completion of the course, the student will be able to:

1. Understand various software life cycle models and their application in real-world projects.
2. Apply project management principles & use of SRS document.
3. Design software using structured, Object Oriented and Agile methodologies, including User Interface design principles.
4. Demonstrate skills in coding, software testing, debugging, and quality management practices.
5. Analyze the role and components of CASE tools, software maintenance, and reuse strategies.

UNIT-I: INTRODUCTION: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering. **Software Life Cycle Models:** Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

UNIT-II: SOFTWARE PROJECT MANAGEMENT: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management. **Requirements Analysis and Specification:** Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT-III: SOFTWARE DESIGN: Overview of the design process, how to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design. Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2) **Function-Oriented Software Design:** Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review. **User**

Interface Design: Characteristics of a good user interface,Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT-IV: CODING AND TESTING: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and Some general issues associated with testing. **Software Reliability and Quality Management:** Software reliability. Statistical testing, Software quality Software quality management system, ISO9000.SEICapability maturity model. Few other Important quality standards, and Six Sigma.

UNIT-V: COMPUTER-AIDED SOFTWARE ENGINEERING (CASE): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment. **Software Maintenance:** Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost. **Software Reuse**: Reuse-definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

Text Books:

1. Fundamentals of Software Engineering, Rajib Mall,5th Edition, PHI.
2. Software Engineering - A Practitioner's Approach, Roger S. Pressman, 9thEdition, McGraw Hill International Edition.

Reference Books:

1. Software Engineering, Ian Sommerville,10thEdition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

e-Resources:

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview

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III B.TECH	CLOUD COMPUTING	L	T	P	C
I SEMESTER		2	0	2	3

Course Objectives:

- To explain the evolving utility computing model called cloud computing.
- To introduce the various levels of services offered by cloud.
- To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
- To emphasize the security and other challenges in cloud computing.
- To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Articulate the main concepts, key technologies, strengths, limitations of cloud computing and the possible applications for state – of – the art cloud computing.
2. Identify the architecture and infrastructure of cloud computing, including cloud delivery and deployment models.
3. Analyze the core issues of cloud computing such as security, privacy, and interoperability.
4. Identify problems, analyze, and evaluate various cloud computing solutions.
5. Analyze appropriate cloud computing solutions and recommendations according to the applications used.

UNIT -I: **INTRODUCTION TO CLOUD COMPUTING FUNDAMENTALS:** Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google App Engine).

UNIT-II: CLOUD ENABLING TECHNOLOGIES: Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.

UNIT-III: VIRTUALIZATION AND CONTAINERS: Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.

UNIT-IV: CLOUD COMPUTING CHALLENGES: Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

UNIT -V: ADVANCED CONCEPTS IN CLOUD COMPUTING: Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

Text Books:

1. Mastering Cloud Computing, 2nd edition, Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, Mc Graw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference Books:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)

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III B.TECH	INTERNET OF THINGS	L	T	P	C
I SEMESTER		2	0	2	3

Prerequisites: Basic knowledge in CN, Python

Course Objectives:

- Vision and Introduction to Internet of Things(IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Identify the basic building blocks of Internet of Things.
2. Design and develop protocols and modules for IoT applications.
3. Understand and implement the technologies required for the development of IoT applications.
4. Implement applications based on sensors and other microcontroller boards.
5. Build cloud based IoT applications in real-time.

UNIT-I: DEFINITION AND CHARACTERISTICS OF IOT: IoT Architectures, Challenges and Issues, Physical Design of IoT, Logical Design of IoT - IoT Functional Blocks, Security.

UNIT-II: CONTROL UNITS: Communication modules – Bluetooth – Zigbee – Wi-Fi, IoT Application and Network Layer Protocols, Wired Communication, Power Sources.

UNIT-III: FOUR PILLARS OF IOT PARADIGM: RFID, Wireless Sensor Networks, SCADA (Supervisory Control and Data Acquisition), M2M, IoT Enabling Technologies – Big Data Analytics – Cloud Computing – Embedded Systems.

UNIT-IV: IOT SYSTEM DESIGN: Working principles of sensors, IoT deployment for Raspberry Pi/Arduino/Equivalent platform, Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, wifi and USB, Contiki OS, Cooja Simulator, Clustering – Clustering for Scalability – Clustering Protocols for IoT.

UNIT-V: API DEVELOPMENT TOOLS: Python based API development, Set up cloud environment – Cloud access from sensors, Data Analytics for IoT, Case studies- Smart Healthcare – Smart Cities – Other recent projects.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, Ïnternet of Things, "A Hands-on Approach", University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs

References

1. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
3. Adrian McEwen, "Designing the Internet of Things", Wiley
4. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill

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III B.TECH	EXPLORATORY DATA ANALYSIS WITH PYTHON	L	T	P	C
I SEMESTER		2	0	2	3

Prerequisites: Python fundamentals

Course Objectives: The main objectives of the course are to

- Introduce the fundamentals of Exploratory Data Analysis
- Cover essential exploratory techniques for understanding multivariate data by
- summarizing it through statistical methods and graphical methods.
- Evaluate the Models and select the best model

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the fundamentals of EDA and distinguish it from traditional statistical approaches
2. Utilize various visual tools and techniques to effectively explore data.
3. Apply data transformation techniques to prepare datasets for analysis.
4. Employ descriptive statistics and perform various types of data analysis.
5. Design and evaluate EDA-driven models for decision-making through real-world case studies.

UNIT-I: EXPLORATORY DATA ANALYSIS FUNDAMENTALS: Understanding data science, Significance of EDA, Steps in EDA, Making sense of data, Numerical data, Categorical data, Measurement scales, Comparing EDA with classical and Bayesian analysis, Software tools available for EDA, Getting started with EDA.

Sample Experiments:

1. a) Download Dataset from Kaggle using the following link:
   https://www.kaggle.com/datasets/sukhmanibedi/cars4u

b) Install python libraries required for Exploratory Data Analysis (numpy, pandas, matplotlib, seaborn)

2. Perform Numpy Array basic operations and Explore Numpy Built-in functions.
3. Loading Dataset into pandas dataframe
4. Selecting rows and columns in the dataframe

UNIT-II: VISUAL AIDS FOR EDA: Technical requirements, Line chart, Bar charts, Scatter plot using seaborn, Polar chart, Histogram, Choosing the best chart **Case Study:** EDA with Personal Email, Technical requirements, Loading the dataset, Data transformation, Data cleansing, Applying descriptive statistics, Data refactoring, Data analysis.

Sample Experiments:

1. Apply different visualization techniques using sample dataset

a. Line Chart b. Bar Chart c. Scatter Plots d. Bubble Plot

2. Generate Scatter Plot using seaborn library for iris dataset

3. Apply following visualization Techniques for a sample dataset

a. Area Plot b. Stacked Plot c. Pie chart d. Table Chart

4. Generate the following charts for a dataset.

a. Polar Chart b. Histogram c. Lollipop chart

Case Study: Perform Exploratory Data Analysis with Personal Email Data

UNIT-III: DATA TRANSFORMATION: Merging database-style data-frames, concatenating along with an axis, merging on index, Reshaping and pivoting, Transformation techniques, Handling missing data, Mathematical operations with NaN, Filling missing values, Discretization and binning, Outlier detection and filtering, Permutation and random sampling, Benefits of data transformation, Challenges.

Sample Experiments:

1. Perform the following operations

a) Merging Dataframes b) Reshaping with Hierarchical Indexing

c) Data Deduplication d) Replacing Values

2. Apply different Missing Data handling techniques

a)NaN values in mathematical Operations b) Filling in missing data

c) Forward and Backward filling of missing values d) Filling with index values

e) Interpolation of missing values

3. Apply different data transformation techniques

a) Renaming axis indexes b) Discretization and Binning

c) Permutation and Random Sampling d) Dummy variables

UNIT-IV: DESCRIPTIVE STATISTICS: Distribution function, Measures of central tendency, Measures of dispersion, Types of kurtosis, calculating percentiles, Quartiles, Grouping Datasets, Correlation, Understanding univariate, bivariate, multivariate analysis, Time Series Analysis

Sample Experiments:

1. Study the following Distribution Techniques on a sample data

a) Uniform Distribution b) Normal Distribution

c) Gamma Distribution d) Exponential Distribution

e) Poisson Distribution f) Binomial Distribution

2. Perform Data Cleaning on a sample dataset.

3. Compute measure of Central Tendency on a sample dataset

a) Mean b) Median c) Mode

4. Explore Measures of Dispersion on a sample dataset

a) Variance b) Standard Deviation c) Skewness d) Kurtosis

5. a) Calculating percentiles on sample dataset

b) Calculate Inter Quartile Range(IQR) and Visualize using Box Plots

6. Perform the following analysis on automobile dataset.
    a) Bivariate analysis b) Multivariate analysis
7. Perform Time Series Analysis on Open Power systems dataset

UNIT-V: MODEL DEVELOPMENT AND EVALUATION: Unified machine learning workflow, Data pre-processing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment

Case Study: EDA on Wine Quality Data Analysis

Sample Experiments:

1. Perform hypothesis testing using stats models library
    a) Z-Test b) T-Test
2. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score. **Case Study:** Perform Exploratory Data Analysis with Wine Quality Dataset

Text book:

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.

Reference Books:

1. Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press, 2020
2. RadhikaDatar, Harish Garg, Hands-On Exploratory Data Analysis with R: Become an expert in exploratory data analysis using R packages, 1st Edition, Packt Publishing, 2019

e-Resources:

1. https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-with-Python
2. https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-dataanalysis-eda-using-python/#h-conclusion
3. https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-Python-Cookbook

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III B.TECH	AUTOMATA THEORY & COMPILER DESIGN	L	T	P	C
I SEMESTER		2	0	2	3

Prerequisites: Discrete Mathematics, Data Structures.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand and apply formal language theory.
2. Design and implement parsers.
3. Understand the phases of a compiler.
4. Apply semantic analysis and error handling.
5. Optimize intermediate and target code.

UNIT-I: INTRODUCTION TO FINITE AUTOMATA: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems. Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions. **Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA.

UNIT-II: REGULAR EXPRESSIONS: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma. **Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT-III: PUSH DOWN AUTOMATA: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine. **Undecidability:** Un-decidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines.

UNIT-IV: INTRODUCTION: The structure of a compiler, Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex. **Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers.

UNIT-V: SYNTAX-DIRECTED TRANSLATION: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax Directed Translation Schemes, Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

Text Books:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
3. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

Reference Books:

1. Introduction to Formal Languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'Reilly
4. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

e-Resources:

1. https://youtu.be/-aIRqNnUvEg?si=knJjtM8PMTvcmyiL
2. https://youtu.be/e73sb5pyriQ?si=6s4sHeLiRK3U_SSR

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III B.TECH	INFORMATION RETRIEVAL LAB	L	T	P	C
I SEMESTER		0	0	3	1.5

Course Outcomes: On completion of this course, the student will be able to

- Compute the similarity bet ween text documents
- Apply all pre-processing steps for text-data
- Implement classification of text documents.
- Perform document clustering using different algorithms.
- Implement PageRank algorithm for any network.

Programming Language: Python/R

Lab Experiments:

1. Representation of a Text Document in Vector Space Model and Computing Similarity between two documents.
2. Pre-processing of a Text Document: stop word removal and stemming
3. Construction of an Inverted Index for a given document collection comprising of at least 50 documents with a total vocabulary size of at least 1000 words.
4. Classification of a set of Text Documents into known classes (You may use any of the Classification algorithms like Naive Bayes, Max Entropy, Rochio's, Support Vector Machine). Standard Datasets will have to be used to show the results.
5. Text Document Clustering using K-means. Demonstrate with a standard dataset and compute performance measures- Purity, Precision, Recall and F-measure.
6. Crawling/ Searching the Web to collect news stories on a specific topic (based on user input). The program should have an option to limit the crawling to certain selected websites only.
7. To parse XML text, generate Web graph and compute topic specific page rank
8. Implement Matrix Decomposition and LSI for a standard dataset.
9. Mining Twitter to identify tweets for a specific period (and/or from a geographical location) and identify trends and named entities.
10. Implementation of PageRank on Scholarly Citation Network.

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III B.TECH	COMPUTER NETWORKS LAB	L	T	P	C
I SEMESTER		0	0	3	1.5

List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as
   i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate& Throughput.

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III B.TECH	FULL STACK DEVELOPMENT -2	L	T	P	C
I SEMESTER		0	1	2	2

Prerequisites: Basics of Java

Course Objectives

- Understand the architecture and workflow of full-stack web applications.
- Define and handle routes, including route and query parameters.
- Implement and handle event listeners in React components.
- Create a basic HTTP server using Node's core modules.
- Prepare for industry-readiness through hands-on MongoDB certification & deployment skills.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Structure and implement HTML/CSS.
2. Apply intermediate and advanced web development practices.
3. Implement basic JavaScript.
4. Create visualizations in accordance with UI/UX theories.
5. Develop a fully functioning website and deploy on a web server.

List of Experiments:

1: ExpressJS – Routing, HTTP Methods, Middleware.

a. Write a program to define a route, Handling Routes, Route Parameters, Query Parameters and URL building.
b. Write a program to accept data, retrieve data and delete a specified resource using http methods.
c. Write a program to show the working of middleware.

2: ExpressJS – Templating, Form Data

a. Write a program using templating engine.
b. Write a program to work with form data.

3: ExpressJS – Cookies, Sessions, Authentication

a. Write a program for session management using cookies and sessions.
b. Write a program for user authentication.

4: ExpressJS – Database, RESTful APIs

a. Write a program to connect MongoDB database using Mangoose and perform CRUD operations.
b. Write a program to develop a single page application using RESTful APIs.

5: ReactJS – Render HTML, JSX, Components – function & Class

a. Write a program to render HTML to a web page.
b. Write a program for writing markup with JSX.
c. Write a program for creating and nesting components (function and class).

6: ReactJS – Props and States, Styles, Respond to Events

a. Write a program to work with props and states.
b. Write a program to add styles (CSS & Sass Styling) and display data.
c. Write a program for responding to events.

7: ReactJS – Conditional Rendering, Rendering Lists, React Forms

a. Write a program for conditional rendering.
b. Write a program for rendering lists.
c. Write a program for working with different form fields using react forms.

8: ReactJS – React Router, Updating the Screen

a. Write a program for routing to different pages using react router.
b. Write a program for updating the screen.

9: ReactJS – Hooks, Sharing data between Components

a. Write a program to understand the importance of using hooks.
b. Write a program for sharing data between components.

10: ReactJS Applications – To-do list and Quiz

a. Design to-do list application.

11: Node.js

a. Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.
b. Write a program to transfer data over http protocolusing http module.
c. Create a text file src.txt and add the following content to it. (HTML, CSS, Javascript, Typescript, MongoDB, Express.js, React.js, Node.js)
d. Write a program to parse an URL using URL module.
e. Write a program to create an user-defined module and show the workflow of Modularization of application using Node.js

12: Typescript

a. Write a program to understand simple and special types.
b. Write a program to understand function parameter and return types.
c. Write a program to show the importance with Arrow function. Use optional, default and REST parameters.

d. Write a program to understand the working of typescript with class, constructor, properties, methods and access specifiers.
e. Write a program to understand the working of namespaces and modules.
f. Write a program to understand generics with variables, functions and constraints.

13: MongoDB – Installation, Configuration, CRUD operations

a. Install MongoDB and configure ATLAS
b. Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()

14: MongoDB – Databases, Collections and Records

a. Write MongoDB queries to Create and drop databases and collections.
b. Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().

15: Augmented Programs: (Any 2 must be completed)

a. Write a CSS program, to apply 2D and 3D transformations in a web page.
b. Design a web page with new features of HTML5 and CSS3.
c. Design a to-do list application using Javascript.
d. Design a to-do list application using NodeJS and ExpressJS.
e. Design a Quiz app using ReactJS.
f. Complete the MongoDB certification from MongoDB University website.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Reference Books:

1. ExpressJS - https://www.tutorialspoint.com/expressjs
2. ReactJS - https://www.w3schools.com/REACT (and) https://react.dev/learn#
3. MongoDB - https://learn.mongodb.com/learning-paths/introduction-to-mongodb

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III B.TECH	TINKERING LAB	L	T	P	C
I SEMESTER		0	0	2	1

Prerequisites: UI Design

Course Objectives:

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:

On successful completion of the course, students will be able to:

1. Implement Flutter & Dart SDK, widgets & layout structures.
2. Design responsive UI and managing breakpoints and Navigation setup and named routes.
3. Understand Stateful /stateless widgets, state management, custom widgets, styling and theming.
4. Analyze Forms and Animations validation.
5. Apply Fetching and displaying API data and Unit testing and debugging.

List of Experiments:

1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.

2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.

3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.

4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.

5. a) Learn about stateful and stateless widgets.
   b) Implement state management using set State and Provider.

6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.

7. a) Design a form with various input fields.
   b) Implement form validation and error handling.

8. a) Add animations to UI elements using Flutter's animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).

9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.

10. a) Write unit tests for UI components.
    b) Use Flutter's debugging tools to identify and fix issues.

Text Books:

1. Marco L. Napoli, “Beginning Flutter: A Hands-on Guide to App Development”, ISBN-13: 978-1119550822, 1st Edition.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1stEdition, Apres, ISBN-13 : 978-1484251805.

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III B.TECH	NATURAL LANGUAGE PROCESSING	L	T	P	C
II SEMESTER		3	0	0	3

Prerequisites: Basic programming skills (Python is commonly used), Understanding of probability and statistics, Familiarity with machine learning concepts, Knowledge of linear algebra and calculus.

Course Objectives:

- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand and apply fundamental NLP concepts, such as language modeling, tokenization, and morphological analysis.
2. Analyze and evaluate N-gram models, PoS tagging, and hidden Markov models for word-level analysis.
3. Apply syntactic parsing techniques using Context-Free Grammars and Probabilistic CFGs for syntactic analysis.
4. Implement semantic analysis using First-Order Logic and Word Sense Disambiguation methods.
5. Analyze discourse and lexical resources for NLP tasks like anaphora resolution and coreference resolution.

UNIT-I: INTRODUCTION: Origins and challenges of NLP – Language Modelling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT-II: WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III: SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing,

Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

UNIT-IV: SEMANTICS AND PRAGMATICS: Requirements for representation, First Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2ndEdition, Daniel Jurafsky, James H. Martin - Pearson Publication,2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, OReilly Media,2009.
3. Natural Language Processing, Pushpak Bhattacharya, Aditya Joshi, Wiley Publications,2023.

Reference Books:

1. Language Processing with Java and Ling Pipe Cookbook, 1stEdition, Breck Baldwin, Atlantic Publisher, 2015.
2. Natural Language Processing with Java, 2ndEdition, Richard M Reese, OReilly Media,2015.
3. Handbook of Natural Language Processing, Second, Nitin Indurkhya and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition.
4. Natural Language Processing and Information Retrieval, 3rdEdition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press,2008.

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III B.TECH	DEEP LEARNING	L	T	P	C
II SEMESTER		3	0	0	3

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Prerequisites: Basic knowledge of **linear algebra, calculus, probability and machine learning fundamentals.**

Course Objective:

The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short-term memory cells and convolution neural networks.

Course Outcomes:

On successful completion of the course, students will be able to

1. Understand the fundamental concepts of neural network models and data representations.
2. Analyze different optimization algorithms to train deep neural networks.
3. Apply neural network generalization and regularization techniques to improve model performance.
4. Develop Convolutional and Recurrent Neural Network architectures for image and sequential data processing.
5. Examine advanced architectures such as Transformers and Generative Models to generate and process data

UNIT-I: BASICS- Biological Neuron, McCulloch–Pitts Model, Perceptron, Perceptron Learning Algorithm, Linear separability, Multilayer perceptron, Learning XOR function.
Data representations for Neural networks: Scalars, Vectors, Matrices, Tensors, Tensor attributes, Notation of batches, Vector data, Time-series data, image data and video data. Tensor Operations: Element-wise operations, Broadcasting, Tensor Product and Reshaping.

UNIT-II: TRAINING NEURAL NETWORKS- Activation Functions, Loss functions, Gradient Descent, Stochastic and Minibatch Gradient Descent, Backpropagation, Deep Neural Networks: Difficulty of training deep neural networks. Other optimizers: Adagrad, RMSProp, Adam, NAG.

UNIT-III: GENERALIZATION AND REGULARIZATION- Initializing Weights in neural networks: Xavier Initialization, Kaiming Initialization. Saddle point problem in neural networks, Generalization: Training, Validation and Test Sets, Under-fitting and Overfitting. Hyper-parameter Tuning and Cross-Validation, Regularization methods: dropout, batch normalization, early stopping, data augmentation.

UNIT-IV: CONVOLUTIONAL NEURAL NETWORKS-Components of CNN Architecture: Convolution Layer, Pooling Layer, Flattening Layer and Fully Connected Layer.

CNN Architectures: LeNet, AlexNet, VGG, UNET. Transfer learning, **Recurrent Neural Networks-** Basic architecture of an RNN, Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs.

UNIT-V: TRANSFORMERS AND GENERATIVE MODELS- Encoder-Decoder Architecture, Attention Mechanism, Transformer Architecture, Multi-headed Attention, Transformer Modes, Popular Transformer Architectures: BERT & GPT. Variational Auto encoders, Generative Adversarial Networks.

Text Books:

1. Deep Learning, Amit Kumar Das, Goswami, Mitra, and Chakrabarti, Pearson Education, First
   Edition, 2024, ISBN:978-9354493874.

Reference Books:

1. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016. ISBN: 978-0262035613.
2. Deep Learning with Python, Francois Chollet, Second Edition, Manning, 2021, ISBN:978-1617296864.

Git Hub Repository:

1. https://github.com/ahkarami/Great-Deep-Learning-Books
2. https://github.com/janishar/mit-deep-learning-book-pdf

YouTube Links:

1. https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLyqSpQzTE6M9gCgajvQbc68Hk_JKGBAYT –Deep Learning Course By NPTEL.
2. https://www.youtube.com/watch?v=CS4cs9xVecg&list=PLkDaE6sCZn6Ec-XTbcX1uRg2_u4xOEky0 - Deep Learning Specialization By Andrew ng.

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III B.TECH	DATA VISUALIZATION	L	T	P	C
II SEMESTER		3	0	0	3

Pre-Requisites: Computer Graphics, Image Processing

Course Objectives:

- familiarize students with the basic and advanced techniques of information visualization and scientific visualization
- learn key techniques of the visualization process
- a detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques

Course Outcomes:

On successful completion of the course, students will be able to:

1. Explain the fundamental concepts of data visualization and apply visual perception and Gestalt principles to interpret data effectively
2. Design appropriate visual representations using visual mapping, analytics, and the visualization reference model
3. Apply suitable visualization and interaction techniques for one-dimensional, two-dimensional, multidimensional, and text data.
4. Construct visualizations for structured data such as groups, trees, graphs, networks, and clusters using appropriate metaphorical techniques
5. Analyze and implement advanced visualization techniques for volumetric data, vector fields, maps, GIS, and collaborative visualization systems.

UNIT-I: INTRODUCTION: What Is Visualization? History of Visualization, Relationship between Visualization and Other Fields, The Visualization Process, Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.

UNIT-II: Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications

UNIT-III: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT-IV: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

UNIT-V: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations,

Evaluating visualizations, Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

Textbooks:

1. Ward, Grinstein, Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”. Natick: A K Peters, Ltd.

2. E. Tufte, “The Visual Display of Quantitative Information”, Graphics Press. 1.

Web Resources:

https://kdd.cs.ksu.edu/Courses/CIS536/Lectures/Slides/Lecture-34-Main_6up.pdf

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III B.TECH	ADVANCED JAVA PROGRAMMING	L	T	P	C
II SEMESTER		2	0	2	3

Course Objectives:

- Understanding and utilizing Java's Collection Framework for data manipulation and storage.
- Building dynamic web applications using Servlets and connecting to databases using JDBC.
- Creating dynamic web pages using JSP.
- Building enterprise applications using the Spring Framework.
- Rapid application development using Spring Boot and ORM with Hibernate.

Course Outcomes:

On successful completion of the course, students will be able to:

1. apply Java Collection Framework interfaces, classes, iterators, comparators, and algorithms to efficiently store, manipulate, and retrieve data in software applications.
2. develop database-driven web applications using JDBC and Servlets by implementing CRUD operations, servlet life cycle management, request/response handling, cookies, and session management.
3. build dynamic web pages using JSP by utilizing directives, expressions, implicit objects, JavaBeans, cookies, and sessions for effective server-side processing.
4. design modular MVC-based applications using the Spring Framework by implementing IoC/DI, Spring Core components, AOP concepts, controllers, view resolvers, and form handling with validation.
5. create and deploy enterprise-level applications using Spring Boot and Hibernate by configuring ORM mappings, performing CRUD operations using HQL/JPA, and building RESTful services.

UNIT-I: COLLECTION FRAMEWORK: The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces, Dictionary, Hash table, Properties, Stack, Vector.

UNIT-II: SERVLETS AND JDBC: JDBC Connectivity: JDBC connectivity, types of Jdbc Drivers, connecting to the database, JDBC Statements, JDBC Exceptions, Manipulations on the database **Introduction to Servlets:** Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions.

UNIT-III: JAVASERVER PAGES (JSP): Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking.

UNIT-IV: SPRING CORE AND SPRING MVC: Introduction to Spring Framework: Overview and Architecture, Spring Modules, Inversion of Control (IoC) and Dependency Injection (DI). **Spring Core:** BeanFactory and ApplicationContext, Bean Life Cycle, Spring Beans and Scopes. **Spring AOP (Aspect-Oriented Programming):** Introduction to AOP, Defining Aspects, Join Points, and AdviceConfiguring AOP in Spring. **Spring MVC:** Overview of Spring MVC, DispatcherServlet and Request Processing, Writing Controllers. **Spring MVC Components:** Views and View Resolvers, Form Handling,Data Binding and Validation

UNIT-V: SPRING BOOT AND HIBERNATE: Introduction to Spring Boot: Overview and Features of Spring Boot, Spring Boot Starter Projects, Creating a Spring Boot Application. **Spring Boot Configuration:** Application Properties, Auto-Configuration,Spring Boot Annotations. **Introduction to Hibernate:** Overview of ORM and Hibernate, Hibernate Architecture, Configuring Hibernate. **Hibernate CRUD Operations:** Entity Lifecycle, HQL (Hibernate Query Language), Managing Transactions.**Spring Boot with Hibernate:** Integrating Hibernate with Spring Boot, Spring Data JPA,Creating a RESTful API with Spring Boot and Hibernate

Text Books:

1. "Java The Complete Reference", Herbert Schildt, MC GRAW HILL Education, 9th Edition, 2016
2. "Internet and World Wide Web – How to program", Dietel and Nieto, Pearson.
3. Java Server Pages –Hans Bergsten, SPD O'Reilly.
2. Spring and Hibernate by Santosh Kumar K, Tata McGraw-Hill Education

Reference Books:

1. Chris Bates, "Web Programming, building internet applications", 2ndEdition, WILEY, Dreamtech, 2008.
2. Thomas A Powel, "The Complete Reference: AJAX", 1st Edition, Tata McGraw Hill, 2008.
3. Web Technologies, Uttam K Roy, Oxford University Press
4. Spring in Action, Craig Walls, Manning Publications, 5th edition, 2018.

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III B.TECH	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
II SEMESTER		2	0	2	3

Prerequisites: Computer Networks

Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand the basic categories of threats to computers and networks
- Discusses the Mathematics of Cryptography
- Discuss the fundamental ideas of Symmetric and Asymmetric Cryptographic Algorithms
- Discusses the Network layer, Transport Layer and Application Layer Protocols Enhanced security mechanisms

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the need of security over the network
2. Apply various cryptographic techniques for providing authentication.
3. Learn various Key Management Techniques for security key sharing.
4. Learn various cryptography algorithms, evaluate their performance.
5. Know various security protocols for real time applications.

UNIT-I: SECURITY CONCEPTS: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography. Classical Encryption Techniques-symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography.

UNIT-II: INTRODUCTION TO SYMMETRIC CRYPTOGRAPHY: Algebraic Structures, Groups, Rings, Fields, GF(2n) fields, Polynomials**. Mathematics of Asymmetric cryptography:** Primes, checking for Primness, Euler's phi-functions, Fermat's Little Theorem, Euler's Theorem, Generating Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

UNIT-III: SYMMETRIC KEY CIPHERS: Block Cipher principles, DES, AES, Blowfish, IDEA, Block cipher operation, Stream ciphers: RC4, RC5 **Asymmetric Key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptographic system, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT-IV: CRYPTOGRAPHIC HASH FUNCTIONS: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithms (SHA) **Message Authentication Codes:** Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MAC'S, MAC'S Based On Hash Functions: HMAC, MAC'S Based on Block Ciphers: DAA & CMAC

UNIT-V: NETWORK AND INTERNET SECURITY: Transport-Level Security: Web Security Considerations, Transport Level Security, HTTPS, SSH. **IP Security:** IP Security Overview, IP Security Policy, Encapsulating Security Payload, Authentication Header Protocol. **Electronic-Mail Security:** Internet-mail Security, Email Format, Email Threats and Comprehensive Email Security, S/MIME, PGP.

Text Books:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 7th Edition, 2017
2. Cryptography and Network Security: Behrouz A. Forouzan Debdeep, Mc Graw Hill, 3rd Edition, 2015

Reference Books:

1. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition
2. Introduction to Cryptography with Coding Theory: Wade Trappe, Lawrence C.

E-Resources:

1. "Cryptography and Network Security" by Prof. Sourav Mukhopadhyay, IIT Kharagpur. Language for Content – English, Duration: 12 Weeks. Link: https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2. "Cryptography and system security" by Tanmai Nagale. Link: https://www.udemy.com/course/cryptography-and-system-security/

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III B.TECH	DEVOPS	L	T	P	C
II SEMESTER		2	0	2	3

Course Objectives: The main objectives of this course are to:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.

Course Outcomes:

On successful completion of the course, the student will be able to:

1. explain the evolution of SDLC, Agile practices, DevOps principles, and the complete DevOps lifecycle, including workflow, automation, and release management.
2. use Git for version control, manage repositories with branching and collaboration, and evaluate code quality using unit testing and SonarQube.
3. configure CI pipelines using Jenkins, automate builds, manage Jenkins users and nodes, and execute CI workflows in real-time software development environments.
4. implement Continuous Delivery and Deployment using Docker containerization, manage images and containers, and perform automated testing using Selenium and JavaScript testing tools.
5. automate deployments using Ansible, orchestrate containerized applications using Kubernetes/OpenShift, and understand configuration tools like Puppet and Chef.

UNIT-I: INTRODUCTION TO DEVOPS: Introduction to SDLC, Agile Model. Introduction to DevOps. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/ CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II: SOURCE CODE MANAGEMENT (GIT): The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working with remote repository, GIT commands, GIT branching, GIT staging and collaboration. **UNITTESTING-CODECOVERAGE:** Junit, n Unit& Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.

UNIT-III: BUILD AUTOMATION - CONTINUOUS INTEGRATION (CI): Build Automation, what is CI Why Cl is Required, CI tools, Introduction to Jenkins (With Architecture), Jenkins workflow, Jenkins master slave architecture, Jenkins Pipelines, **PIPELINE BASICS -** Jenkins Master, Node, Agent, and Executor Freestyle Projects& Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes**.**

UNIT-IV: CONTINUOUS DELIVERY: Importance of Continuous Delivery, CONTINUOUS DEPLOYMENT CD Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, Docker File, running containers, working with containers and publish to DockerHub. TESTING TOOLS: Introduction to Selenium and its features, Java Script testing.

UNIT-V: CONFIGURATION MANAGEMENT - ANSIBLE: Introduction to Ansible, Ansible tasks Roles, Jinja2 templating, Vaults, Deployments using Ansible. **CONTAINERIZATION USING KUBERNETES(OPENSHIFT):** Introduction to Kubernetes Namespace& Resources, CI/CD - On OCP, BC, DC & ConfigMaps, Deploying Apps on Openshift Container Pods. Introduction to Puppet master and Chef.

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Developtestcasesfortheabovecontainerizedapplicationusingselenium.

Text Books

1. Joyner, Joseph., Devops for Beginners: Devops Software Development Method Guide for Software Developers and It Professionals, 1st Edition Mihails Konoplows, 2015.
2. Alisson Machado de Menezes., Hands-on DevOps with Linux,1st Edition, BPB Publications, India, 2021.

Reference Books

1. LenBass, IngoWeber, LimingZhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10
2. Gene Kim Je Humble, Patrick Debois, John Willis. The DevOps Handbook, 1st Edition, IT Revolution Press, 2016.
3. Verona, Joakim Practical DevOps,1st Edition, Packt Publishing,2016.
4. Joakim Verona. Practical Devops, 2nd Edition. Ingram short title; 2nd edition (2018).

ISBN10: 1788392574
5. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's View point. Wiley publications. ISBN: 9788126579952

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III B.TECH	RECOMMENDER SYSTEMS	L	T	P	C
II SEMESTER		2	0	2	3

Prerequisites: NLP

Course Objectives:

- This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences

Course Outcomes:

On successful completion of the course, the student will be able to:

1. Understand basic techniques and problems in the field of recommender systems.
2. Evaluate types of recommender systems: non personalized, content based, collaborative filtering.
3. Apply algorithms & techniques to develop recommender systems that are widely used in internet.
4. To learn the ethical ways to develop the recommender systems.
5. To develop state-of-the-art recommender systems.

UNIT-I: INTRODUCTION: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

UNIT-II: COLLABORATIVE FILTERING: User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems.

UNIT-III: CONTENT-BASED RECOMMENDATION: High level architecture of content-based systems, Advantages and drawbacks of content-based filtering, Item profiles, discovering features of documents, obtaining item features from tags, representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms. **Knowledge based recommendation:** Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders.

UNIT-IV: HYBRID APPROACHES: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.

UNIT-V: EVALUATING RECOMMENDER SYSTEM: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centered metrics. **Recommender Systems and communities:** Communities, collaboration and recommender systems in personalized web search, social tagging recommender systems, Trust, and recommendations.

Text Books:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st Ed.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer (2011), 1st ed.

References Books:

1. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.

e-Resources:

1. "Recommender Systems" by Prof. Mamata Jenamani, IIT Kharagpur. Language for Content – English, Duration: 8 Weeks. Link: https://onlinecourses.nptel.ac.in/noc24_ge35/preview
2. "Recommender Systems and Deep Learning in Python" by Lazy Programmer INC. Link: https://www.udemy.com/course/recommender-systems/

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III B.TECH II SEMESTER	SOFTWARE PROJECT MANAGEMENT	L 2	T 0	P 2	C 3

Course Objectives:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course outcomes:

On successful completion of the course, students will be able to:

1. Apply the process to be followed in the software development life-cycle models
2. Apply the concepts of project management & planning
3. Implement the project plans through managing people, communications and change
4. Conduct activities necessary to successfully complete and close the Software projects
5. Implement communication, modeling, and construction & deployment practices in software development

UNIT-I: CONVENTIONAL SOFTWARE MANAGEMENT: The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software Economics, pragmatic software cost estimation. Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II: LIFE CYCLE PHASES: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artefacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artefacts.

UNIT-III: Model based software architectures: A Management perspective and technical perspective**. Work Flows of the process:** Software process work flows, Iteration work flows. **Check points of the process:** Major milestones, Minor Mile stones, Periodic status assessments. Iterative Process Planning: Work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT-IV: PROJECT ORGANIZATIONS AND RESPONSIBILITIES: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V: Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility**. Fundamentals of DevOps:** Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOp secosystem. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, Peopleaspect, processes

Text Books:

1. Software Project Management, Walker Royce, PEA,2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim, John Willis, Patrick Debois, Jez Humb,1st Edition, O'Reilly publications,2016.

Reference Books:

1. Software Project Management, BobHughes,3/e,Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, PankajJalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki,Wiley,2006.
5. Project Management in IT,Kathy Schwalbe, Cengage.

III B.TECH	MOBILE ADHOC AND SENSOR NETWORKS	L	T	P	C
II SEMESTER		2	0	2	3

UNIT-I: Introduction- Adhoc networks. Mobile Ad-Hoc networking with a View of 4G Wireless, Off-the-Shelf Enables of Ad Hoc, IEEE 802.11 in Ad Hoc Networks:

UNIT-II: Protocols, Performance and Open Issues, Scatternet Formation in Bluetooth Networks, Antenna Beamforming and Power Control for Ad Hoc Networks, Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks.

UNIT-III: Location Discovery, Routing Approaches in Mobile AdHoc Networks, Energy-Efficient Communication in AdHoc Wireless, AdHoc Networks Security, Self-Organized and Cooperative Ad Hoc Networking.

UNIT-IV: Simulation and Modeling of Wireless, Mobile, and AdHoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization Algorithmic Challenges in Ad Hoc Networks.

UNIT-V: SENSOR NETWORKS: Introduction to sensor network, Unique constraints and challenges, Localization and Tracking, Networking Sensors, Infrastructure establishment, Sensor Tasking and Control, Sensor network databases, Sensor Network Platforms and tools, Industrial Applications and Research directions.

Text Books:

1. Mobile Adhoc Networks–Aggelou, George(McGraw-Hill).
2. Mobile Adhoc Networking –Stefano Basagni (Editor), Marco Conti(Editor), Silvia Giordano(Editor),Ivan Stojmenovi&Cacute (Editor) (Wiley-IEEE Press).

References:

1. Wireless Sensor Networks: An Information Processing Approach–Feng Zhao,Leonidas Guibas(Elsevier).
2. Hand book of Sensor Networks: Algorithms and Architectures–Ivan Stojmenovi& Cacute(Wiley).

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III B.TECH	COMPUTER VISION	L	T	P	C
II SEMESTER		2	0	2	3

Prerequisites: A foundational understanding of programming, especially in Python, and some basic familiarity with machine learning & deep learning concepts would likely be advantageous for students taking this course.

Course Objectives:

- To understand the Fundamental Concepts related to sources, shadows and shading
- To understand the Geometry of Multiple Views

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the evolution of computer vision from traditional techniques transformer based models.
2. Apply basic PyTorch operations to manipulate image data using tensors, DataLoaders, and automatic differentiation on datasets like MNIST.
3. Experiment with simple CNN-based architectures to perform object detection using anchor-based and anchor-free approaches.
4. Compare different segmentation methods – semantic, instance, and panoptic – and evaluate the utility of models like SAM in practical scenarios.
5. Explain the core principles of self-supervised learning and summarize the architectural components of Vision Transformers with examples of their application in classification tasks.

UNIT-I: INTRODUCTION TO MODERN COMPUTER VISION: Basics of computer vision evolution from CNNs to Transformers, Introduction to Zero-shot and Few-shot Learning with basic examples, Conceptual overview of DETR, CLIP, BLIP.

UNIT-II: FUNDAMENTALS OF IMAGE PROCESSING WITH PYTORCH: A foundational introduction to PyTorch, - tensors, scalers, vectors, matrices, and N-dimensional tensors. Working with tensors on CPU and GPU. Image processing with PyTorch, covering essential building blocks, data loaders, and datasets. Processing the MNIST dataset using PyTorch, focusing on computing gradients for optimization, building computational graphs, and leveraging the automatic differentiation engine for efficient model training.

UNIT-III: BASIC OBJECT DETECTION WITH CNNS: Simple CNN construction for object detection, One-stage vs Two-stage detection, Region Of Interest (ROI), ROI align, ROI pooling, ROI wrapping, anchor boxes and distinguishing between anchor-based and anchor-free methods, Anchor box concept, 1024x1024 image processing challenges.

UNIT-IV: INTRODUCTION TO SEGMENTATION TECHNIQUES: Semantic vs Instance vs Panoptic Segmentation, CNN & Transformer based segmentation approaches, Segment Anything Model concept and basic use cases, Loss functions and model evaluation.

UNIT-V: SELF-SUPERVISED AND VISION TRANSFORMER BASICS: Basic idea of contrastive learning – SimCLR & BYOL, Vision Transformers, difference between CNNs and Vision Transformers, Simple use cases – image classification & retrieval.

Text Books:

1. Z. Ralte, Mastering New Age Computer Vision: Advanced Techniques in Computer Vision Object Detection, Segmentation, and Deep Learning. New Delhi, India: BPB Publications, 2025. ISBN-10: 9365898404.

References

1. S. Gollapudi, Learn Computer Vision Using OpenCV: With Deep Learning CNNs and RNNs. New York, NY, USA: Apress, 2019. ISBN-13: 978-1-4842-4260-5.
2. D. A. Forsyth and J. Ponce, Computer Vision: A Modern Approach, 2nd ed. Upper Saddle River, NJ, USA: Pearson Education, 2012. ISBN-13: 978-0-13-608592-8.
2. Fundamentals of Deep Learning, Nithin Buduma, Nikhil Buduma & Joe Papa, O'Reilly, Second Edition, 2022. ISBN: 978-93-5542-012-1.

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III B.TECH	NO SQL DATABASES	L	T	P	C
II SEMESTER		2	0	2	3

Course Outcomes:

On successful completion of the course, students will be able to:

1. compare different types of NoSQL Databases
2. compare and
3. contrast RDBMS with different NoSQL databases.
4. demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.
5. explain performance tune of Key-Value Pair NoSQL databases.
6. apply NoSQL development tools on different types of NoSQL Databases.

UNIT-I: Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT-II: Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT-III: NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT-IV: Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT-V: NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data,

Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

Text Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2019.

Reference Books:

1. Eric Redmond, Jim R. Wilson, Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, Pragmatic Bookshelf second edition

Web References:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

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III B.TECH	DEEP LEARNING LAB	L	T	P	C
II SEMESTER		0	0	3	1.5

Prerequisites: Foundational knowledge in Python programming, and machine learning concepts such as classification and regression. Familiarity with libraries like NumPy and Pandas is recommended.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Develop deep neural networks to solve real world problems
2. Apply transfer learning & pre-trained models for efficient image classification & recognition
3. Develop sequence models using RNNs and LSTMs
4. Implement word representation techniques & word embedding for text-based applications.
5. Apply advanced deep learning models including Seq2Seq for translation

List of Experiments:

1. Design a neural network for predicting house prices using Boston Housing Price dataset.
2. Implement multi-layer perceptron algorithm for MNIST Handwritten Digit Classification.
3. Build a Convolution Neural Network for MNIST Handwritten Digit Classification.
4. Build a Convolution Neural Network for simple image (dogs and Cats) Classification.
5. Use a Pre-trained Convolution Neural Network (VGG16, AlexNet) for image classification.
6. Implement one hot encoding of words or characters.
7. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
8. Design a Neural Network for classifying newswires (Multiclass Classification) using Reuters dataset.
9. Implement word embeddings for IMDB dataset.
10. Implement a Recurrent Neural Network & LSTM for IMDB movie review classification problem.
11. To implement a Seq2Seq Model for Neural Machine Translation.
12. To Implement a CNN for object detection in the given image.

Text Books:

1. Reza Zadeh and Bharath Ramsundar, “TensorFlow for Deep Learning”, O’Reilly publishers, 2018.

Reference Books:

1. Francois Chollet “Deep Learning with Python” Manning Publications, 2021.

Git Hub Repository:

1. https://github.com/fchollet/deep-learning-with-python-notebooks

YouTube Links:

1. https://www.youtube.com/playlist?list=PLeo1K3hjS3uu7CxAacxVndI4bE_o3BDtO

2. https://www.youtube.com/playlist?list=PL9ooVrP1hQOEX8BKDplfG86ky8s7Oxbzg

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III B.TECH	DATA VISUALIZATION LAB	L	T	P	C
II SEMESTER		0	0	3	1.5

Prerequisites: Python

Course Objectives:

- To visualize the different datasets using histograms, line charts.
- To understand the use of bar charts and box plots.
- To understand Scatter plots, mosaic plots
- To understand different Map visualizations
- To learn advanced graphs such as correlogram, heatmap and 3D graphs.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Write Python code to generate basic and advanced plots using Matplotlib and Seaborn.
2. Create interactive and statistical graphics using Plotly and Seaborn for in-depth data analysis.
3. Develop interactive dashboards and visual analytics using Tableau and Plotly Dash.
4. Perform geo-spatial data visualizations using Plotly and Folium.
5. Understand and apply the fundamentals of web-based visualization using D3.js.

List of Experiments:

1: Introduction to Python and Matplotlib
2: Creating basic plots: Bar, Line, Pie, Histogram
3: Seaborn for statistical graphics (Boxplot, Violin Plot)
4: Exploratory Data Analysis using Plotly
5: Introduction to Tableau: Importing and exploring datasets
6: Designing Dashboards in Tableau
7: Interactive visualizations with Plotly Dash
8: Geo-visualization using Plotly and Folium
9: D3.js Introduction and first web visualization
10: Project Proposal and Dataset Selection
11: Project Implementation Phase 1
12: Project Implementation Phase 2 and Presentation

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III B.TECH	SOFT SKILLS	L	T	P	C
II SEMESTER		0	1	2	2

Course Objectives:

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal & writing skills

UNIT-I: ANALYTICAL THINKING & LISTENING SKILLS: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening), Self – Analysis, Developing Positive Attitude, Perception. **Communication Skills:** Verbal & Non Verbal Communication;

UNIT-II: SELF-MANAGEMENT SKILLS: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities **Etiquette:** Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT-III: STANDARD OPERATION METHODS: Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

UNIT-IV: JOB-ORIENTED SKILLS: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V: INTERPERSONAL RELATIONSHIPS: Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

Text books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

Reference books:

1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
2. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-resources:

1. https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01

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III B.TECH	TECHNICAL PAPER WRITING & IPR	L	T	P	C
II SEMESTER		2	0	0	-

Course Objective:

- The course will explain the basic related to writing the technical reports and understanding the concepts related to formatting and structuring the report. This will help students to comprehend the concept of proofreading, proposals and practice

UNIT-I: INTRODUCTION: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing. **Planning and Structuring:** Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

UNIT-II: DRAFTING REPORT AND DESIGN ISSUES: The use of drafts, Illustrations and graphics. **Final edits:** Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

UNIT-III: PROOFREADING AND SUMMARIES: Proofreading, summaries, Activities on summaries. **Presenting final reports:** Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

UNIT-IV: USING WORD PROCESSOR: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros,

UNIT-V: NATURE OF INTELLECTUAL PROPERTY: Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property

Text Books:

1. Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2. William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
3. Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.

Reference Books:

1. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
2. Day R, how to Write and Publish a Scientific Paper, Cambridge University Press(2006)

E-resources:

1. https://www.udemy.com/course/reportwriting/
2. https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
3. https://www.udemy.com/course/betterbusinesswriting/

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FOURTH YEAR COURSE STRUCTURE AND SYLLABUS
IV B. TECH – I SEMESTER

S. No	Course Code	Subjects	L/ D	T	P	Credits
1	PC22	Augmented Reality and Virtual Reality	2	0	2	3
2	MC-II	Human Resource Management	3	0	0	3
3	PE - IV	1. Responsible AI 2. Block Chain Technologies 3. AI in Healthcare 4. Quantum Computing 5. 12 week MOOC Swayam /NPTEL course recommended by the BoS	2	0	2	3
4	PE - V	1. Agile methodologies 2. Big Data Analytics 3. Reinforcement Learning 4. High Performance Computing 5. 12 week MOOC Swayam/NPTEL course recommended by the BoS	2	0	2	3
5	OE – III	1. Environmental Pollution Control 2. Unnamed Aerial Vehicles 3. Electrical Power Quality 4. Testing & Automation	3	0	0	3
6	OE – IV	1. Renewable Energy Technologies 2. Construction Technology 3. Energy Conservation and Auditing 4. IOT	3	0	0	3
7	SEC	Prompt Engineering / SWAYAM Plus - Certificate program in Prompt Engineering and ChatGPT	0	1	2	2
8	AC	Constitution of India	2	0	0	-
9	Internship	Evaluation of Industry Internship / Mini Project	-	-	-	2
		Total Credits				**22**
MC	Student may select from the same Minor's Pool		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3
HC	Student may select from the same Honor's Pool		3	0	0	3

IV B.TECH	GENERATIVE AI	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Prior knowledge of Calculus, Linear Algebra, Probability Theory, and Python programming are essential.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the evolution of AI and the significance of Deep Learning.
2. Apply various NN architectures for tasks like image recognition & sequence modelling.
3. Analyze data pre-processing and training techniques for neural networks.
4. Design practical solutions using advanced neural networks for diverse applications.
5. Understand large language models' architecture and pre-training techniques.

UNIT-I: FOUNDATIONS OF AI AND NEURAL NETWORKS: History and evolution of AI/ML, Deep learning revolution, transfer learning, History of Neural Natural Language Processing, Structure of Artificial Neural Networks, Steps in Training an Artificial Neural Network, Parameters and Hyper parameters, Back propagation.

UNIT-II: ADVANCED NEURAL NETWORK ARCHITECTURES: Introduction to advanced architectures, Introduction to Generative AI Models: Generative Adversarial Networks(GANs), Variational Auto-encoders(VAEs), Transformers, Attention Mechanism in detail Long Short-Term Memory Networks(LSTMs)

UNIT-III: DATA PRE-PROCESSING: Probability and Statistics, Data Pre-processing Techniques, Model Training Techniques

UNIT-IV: GENERATIVE AI APPLICATIONS: Applications in Various Fields: Art and Creativity, Image and Video Generation, Text Generation, Music Composition, Healthcare Finance. Real-world usecases and challenges in deploying generative AI models

UNIT-V: INTRODUCTION TO LARGE LANGUAGE MODELS: Overview of Generative AI and Large Language Models. Basics of attention mechanisms and Transformer architecture. Pre-training techniques and transfer learning strategies

Text Books:

1. “Generative AI for everyone: Understanding the essentials and applications of this break through technology". Altaf Rehmani.
2. "Introduction to Generative AI”, Numa Dhamani, Kindle Edition, 2024.
3. "Neural Networks and Deep Learning: A Textbook" by Charu C. Aggarwal

Reference Books:

1. "Generative Adversarial Networks Cook book: Over 100 recipes to build generative models using Python, Tensor Flow, and Keras" by Josh Kalin.
2. “Generative AI in Software Development: Beyond the Limitations of Traditional Coding” Jesse Sprinter, 2024

e-Resources:

1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching-programming-course s/?v=c86ee0d9d7ed
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-language-models/?v=c86ee0d9d7ed

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IV B.TECH	QUANTUM COMPUTING	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Linear Algebra (vector spaces, matrices, eigenvalues/eigenvectors), Probability and Statistics (basic probability theory), Classical Algorithms and Complexity (basic understanding of computational models and algorithms), Fundamentals of Computer Programming (preferably Python, as Qiskit and Q# are used)

Course Outcomes:

On successful completion of the course, students will be able to:

1. Describe fundamental quantum concepts using Dirac notation.
2. Demonstrate quantum algorithms through circuit diagrams and mathematical steps.
3. Compare physical implementations of quantum hardware and their error profiles.
4. Classify quantum error correction codes and their applicability in NISQ devices.
5. Implement basic quantum circuits using Qiskit for entanglement and measurement tasks.

UNIT-I: INTRODUCTION TO QUANTUM MECHANICS AND QUANTUM COMPUTING: Classical vs. Quantum Computation, Qubits and Quantum States, Superposition Principle, Quantum Measurement and Probabilities, Entanglement and Bell States, Bloch Sphere Representation, Quantum Gates and Unitary Operations, Single-Qubit Gates: Pauli-X, Y, Z; Hadamard, Multi-Qubit Gates: CNOT, Toffoli, Quantum Circuits and Reversibility, No-Cloning Theorem, Introduction to Dirac Notation (Bra-Ket Notation), Tensor Products and Multi-Qubit Systems, Basic Postulates of Quantum Mechanics in Computing Context, Overview of Quantum Computing Applications.

UNIT-II: QUANTUM ALGORITHMS AND COMPLEXITY: Quantum Parallelism, Quantum Speedup and Oracle-based Computation, Deutsch and Deutsch–Jozsa Algorithms, Bernstein–Vazirani Algorithm, Simon's Algorithm, Grover's Search Algorithm and Amplitude Amplification, Shor's Factoring Algorithm and Quantum Fourier Transform, Phase Estimation Algorithm, Quantum Counting, Introduction to Quantum Complexity Classes (BQP, QMA, etc.), Comparison with Classical Complexity Classes, Limitations of Quantum Algorithms, Overview of Quantum Algorithm Design Principles.

UNIT-III: QUANTUM HARDWARE AND TECHNOLOGIES: Physical Realization of Qubits, Superconducting Qubits, Trapped Ions, Topological Qubits, Quantum Dots and Photonic Qubits, Quantum Gate Implementation on Physical Devices, Quantum Circuit Compilation and Optimization, Quantum Decoherence and Noise, Quantum Error Sources and Mitigation Techniques, Introduction to Quantum Error Correction Codes, NISQ (Noisy Intermediate-Scale Quantum) Devices, Quantum Hardware Platforms (IBM Q, Rigetti, IonQ, Google Sycamore).

UNIT-IV: QUANTUM INFORMATION THEORY: Quantum Entropy and von Neumann Entropy, Quantum Mutual Information, Quantum Data Compression, Quantum Teleportation Protocol, Superdense Coding, Quantum Key Distribution (BB84, E91 Protocols), Quantum Error Correction Principles, Stabilizer Codes, Shor and Steane Codes, Quantum Channels and Noise Models, Quantum Capacity and Channel Coding Theorems, Quantum Cryptography Fundamentals, Entanglement Distillation and Purification, Resource Theories in Quantum Information, Applications of Quantum Information Theory in Communication.

UNIT-V: PRACTICAL QUANTUM COMPUTING APPLICATIONS: Industrial Use Cases of Quantum Computing, Integration of Quantum and Classical Computing, Programming Quantum Computers Using Qiskit and Microsoft Q#, Cloud-based Quantum Computing Platforms, Hands-on Projects and Case Studies, Future Trends in Quantum Computing Applications.

Text Books:

1. Nielsen, M. A., & Chuang, I. L. (2010). Quantum Computation and Quantum Information: 10th Anniversary Edition. Cambridge University Press. ISBN: 9781107002173
2. Lipton, R. J., & Regan, K. W. (2014). Quantum Algorithms via Linear Algebra: A Primer. The MIT Press. ISBN: 9780262028394

References

1. Rieffel, E. G., & Polak, W. H. (2011). Quantum Computing: A Gentle Introduction. The MIT Press. ISBN: 0262526670
2. Jacobs, K. (2014). Quantum Measurement Theory and Its Applications. Cambridge University Press. ISBN: 1107025486
3. Yanofsky, N. S., & Mannucci, M. A. (2008). Quantum Computing for Computer Scientists. Cambridge University Press. ISBN: 9780521879965

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IV B.TECH	NO SQL DATABASES	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Fundamentals of DBMS and RDBMS

Course Outcomes:

On successful completion of the course, students will be able to:

1. Explain and compare different types of NoSQL Databases
2. Compare and contrast RDBMS with different NoSQL databases.
3. Demonstrate the detailed architecture & performance tune of Document-oriented NoSQL DBs.
4. Explain performance tune of Key-Value Pair NoSQL databases.
5. Apply NoSQL development toohuls on different types of NoSQL Databases.

UNIT-I: Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT-II: Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT-III: NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT-IV: Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT-V: NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences,

Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

Text book:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition,2019.

Reference Books:

1. Eric Redmond, Jim R. Wilson, Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, Pragmatic Bookshelf second edition

e-Resources:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

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IV B.TECH	ROBOTIC PROCESS AUTOMATION	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Fundamentals of RPA.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Describe RPA, where it can be applied and how it's implemented.
2. Identify and understand Web Control Room and Client Introduction.
3. Understand how to handle various devices and the workload.
4. Understand Bot creators, Web recorders and task editors.
5. Applying automation to PDF documents.

UNIT-I: INTRODUCTION TO ROBOTIC PROCESS AUTOMATION & BOT CREATION INTRODUCTION TO RPA AND USE CASES: Automation Anywhere Enterprise Platform – Advanced features and capabilities – Ways to create Bots.

UNIT-II: WEB CONTROL ROOM AND CLIENT INTRODUCTION: Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials).

UNIT-III: DEVICES (VIEW DEVELOPMENT AND RUNTIME CLIENTS AND DEVICE POOLS): Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion – Client introduction and Conclusion.

UNIT-IV: BOT CREATOR INTRODUCTION: Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command.

UNIT-V: TERMINAL EMULATOR COMMAND: PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer.

Text Books:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition.

References:

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

E – Learning Resources:

1. https://academy.uipath.com/learning-plans/automation-developer-associate-training-(v2023.10)

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IV B.TECH	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Understanding software testing principles, having a good grasp of different testing methodologies, Possessing strong communication and organizational skills

Course outcomes:

On successful completion of the course, students will be able to:

1. Apply the process to be followed in the software development life-cycle models
2. Apply the concepts of project management & planning
3. Implement the project plans through managing people, communications and change
4. Conduct activities necessary to successfully complete and close the Software projects
5. Implement communication, modeling, and construction & deployment practices in software development

UNIT-I: **CONVENTIONAL SOFTWARE MANAGEMENT:** The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II: LIFE CYCLE PHASES: Engineering and production stages, inception, Elaboration, construction, transition phases. **Artefacts of the process:** The artefact sets, Management artefacts, Engineering artefacts, programmatic artefacts.

UNIT- III: MODEL BASED SOFTWARE ARCHITECTURES: A Management perspective and technical perspective. Work Flows of the process: Software process workflows, Iteration workflows. **Checkpoints of the process:** Major mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT- IV: PROJECT ORGANIZATIONS AND RESPONSIBILITIES: Line-of-Business Organizations, Project Organizations, evolution of Organizations. **Process Automation:** Automation Building blocks, The Project Environment. **Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V: AGILE METHODOLOGY: ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. **Fundamentals of DevOps:** Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. **DevOps adoption in projects:** Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:

1. Software Project Management, Walker Royce, PEA, 2005. ISBN-10. 8177583786; ISBN-13. 978-8177583786.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.\
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim, John Willis, Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

Reference Books:

1. Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2. Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, Pankaj Jalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5. Project Management in IT, Kathy Schwalbe, Cengage

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IV B.TECH	AGILE METHODOLOGIES	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Basic Understanding of Software Development Lifecycle - Understand stages like requirements gathering, design, development, testing, and deployment. Problem-Solving and Critical Thinking - Agile teams must adapt quickly and make decisions collaboratively.

Course Outcomes:

On successful completion of the course, students will be able to:

1. introduce characteristics of an agile development process.
2. understand agile software development process models and plan driven process models.
3. understand software project characteristics that would be suitable for an agile process.
4. impart and Identify software project characteristics that would not be suitable for an agile process.
5. implement a small scale software project using the Scrum process methodology

UNIT-I: History of Agile Methodologies, Agile and Lean Software Development: Basics and Fundamentals, Extreme Programming, Scrum, Agile and Scrum Principles Agile Manifesto, Twelve Practices of XP.

UNIT-II: Agile Estimation & Planning, Agile Requirements, Agile techniques to improve requirements, User Stories, Backlog Management: scrum product backlog, product backlog, Agile Architecture.

UNIT-III: Tracking Agile Projects, Time tracking agile projects, Tracking agile development project progress. Lean Software Development, Agile model driven development, Agile Risk management.

UNIT-IV: Agile Project Tools, Enterprise Agility, Dynamic Systems Development Method, Continuous Integration(CI).

UNIT-V: Team Dynamics and Collaboration, Enterprise agile project team, Agile Testing, Scaling Agile for Large Projects, Best Practices for Achieving Agile at Scale.

Text Books:

1. Agile Development with Scrum, Ken Schwaber and Mike Beedle, Prentice Hall, 2001.
2. Integrating Agile Development in the Real World, Peter Schuh, Charles River Media, 2005.

Reference Books:

1. Agile Software Development – The Cooperative Game (2nd Edition), Alistair Cockburn, 2007

2. Succeeding With Agile, Software Development Using Scrum, Mike Cohn, Addison Wesley, 2010

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IV B.TECH	HIGH PERFORMANCE COMPUTING	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Operating System, Computer Organization and Architecture, Programming in C/C++, Data structure and algorithms.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Describe the evolution and architectures of high performance computing systems.
2. Explain cluster computing models, types, and fault-tolerant techniques
3. Apply message-passing models and scheduling algorithms in high-speed networks.
4. Apply CUDA programming principles to develop basic parallel applications
5. Use OpenMP and OpenCL constructs for shared and distributed memory programming.

UNIT-I: INTRODUCTION TO HIGH PERFORMANCE COMPUTING: Era of Computing, Scalable Parallel Computer Architectures, towards low-cost computing, Network of Workstations project by Berkeley, Cluster Computing Architecture, Components, Cluster Middleware and SSI, Need of Resource Management and Scheduling, Programming Environments

UNIT-II: CLUSTER COMPUTING: Clustering Models, Clustering Architectures, Clustering Architectures key factors, types of clusters, Mission critical Vs Business Critical Applications, Fault Detection and Masking Algorithms, Check pointing, Heartbeats, Watchdog Timers, Fault recovery through Failover and Failback Concepts

UNIT-III: HIGH SPEED NETWORKS & MESSAGE PASSING: Introduction to High-Speed Networks, Lightweight Messaging Systems, Xpress Transport Protocol, Software RAID and Parallel File systems, Load Balancing Over Networks – Algorithms and Applications, Job Scheduling approaches and Resource Management in Cluster

UNIT-IV: CUDA PROGRAMMING: Introduction to CUDA architecture for parallel processing, CUDA Parallelism Model, Foundations of Shared Memory, Introduction to CUDA-C, Parallel programming in CUDA-C, Thread Cooperation and Execution Efficiency, Constants memory and events, memory management, CUDA-C on multiple GPUs, Hashing and Natural Parallelism, Scheduling and Work Distribution, Atomics, Barriers and Progress, Transactional Memory

UNIT-V: OPEN CL PROGRAMMING: Introduction to OpenCL, OpenCL Setup, Basic OpenCL, Advanced OpenCL **Shared-memory programming**, **OpenMP:** Introduction to OpenMP, Parallel Programming using OpenMP

Textbooks:

1. Rajkumar Buyya, High Performance Cluster Computing – Volume 1: Architectures and Systems, Pearson Education.
2. Wen-mei W. Hwu, David B. Kirk, Programming Massively Parallel Processors: A Hands-on Approach, Morgan Kaufmann.

Reference Books:

1. Barbara Chapman, Gabriele Jost, Ruud van der Pas, Using OpenMP: Portable Shared Memory Parallel Programming, MIT Press.
2. Georg Hager and Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, CRC Press.

e-Resources:

1. NPTEL Course – High Performance Computing: https://nptel.ac.in/courses/106104179
2. CUDA Documentation: https://docs.nvidia.com/cuda/
3. OpenMP Specification and Guides: https://www.openmp.org/
4. OpenCL Documentation: https://registry.khronos.org/OpenCL/
5. Parallel Programming Tutorials (MIT OpenCourseWare): https://ocw.mit.edu/

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IV B.TECH	BLOCK CHAIN TECHNOLOGY	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Cryptography and Network Security, Computer Networks

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the fundamentals and components of block chain and consensus mechanisms.
2. Differentiate between public, private, and consortium block chains with real-world relevance.
3. Design smart contracts & implement basic block chain applications using tools like Python and Hyper ledger.
4. Evaluate the security, privacy, and regulatory aspects of block chain systems
5. Analyze block chain applications in various industries using real-world case studies.

UNIT-I: **FUNDAMENTALS OF BLOCK CHAIN:** Introduction, Origin of Block chain, Block chain Solution, Components of Block chain, Block in a Block chain, The Technology and the Future. **Block chain Types and Consensus Mechanism:** Introduction, Decentralization and Distribution, Types of Block chain, Consensus Protocol. **Cryptocurrency:** Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

UNIT-II: PUBLIC BLOCK CHAIN SYSTEM: Introduction, Public Block chain, Popular Public Block chains, The Bitcoin Block chain, Ethereum Block chain. **Smart Contracts:** Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

UNIT-III: PRIVATE BLOCK CHAIN SYSTEM: Introduction, Key Characteristics of Private Block chain, Private Block chain, Private Block chain Examples, Private Block chain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Block chain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Block chain, Byzantine Fault, Multi chain. **Consortium Block chain:** Introduction, Key Characteristics of Consortium Block chain, Need of Consortium Block chain, Hyper ledger Platform, Overview of Ripple, Overview of Corda. **Initial Coin Offering:** Introduction, Block chain Fundraising Methods, launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

UNIT-IV: SECURITY IN BLOCK CHAIN: Introduction, Security Aspects in Bit coin, Security and Privacy Challenges of Block chain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance,

Safeguarding Block chain Smart Contract (DApp), Security Aspects in Hyper ledger Fabric. **Applications of Block chain:** Introduction, Block chain in Banking and Finance, Block chain in Education, Block chain in Energy, Block chain in Healthcare, Block chain in Real-estate, Block chain in Supply Chain, The Block chain and IoT, Limitations and Challenges of Block chain.

UNIT-V: BLOCK CHAIN CASE STUDIES: Case Study 1 – Retail, Case Study 2 – Energy and Utilities. Block chain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Block chain. **Block chain platform using Hyperledger Fabric:** Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Block chain Application Using Fabric Java SDK.

Text book:

1. Block chain Technology, Chandramouli Subramanian, Asha A.George, Abhilasj K A and Meena Karthikeyan , Universities Press, 2020, eISBN: 9789389211795.

Reference Books:

1. Block chain Blue print for Economy, Melanie Swan, SPD Oreilly,2015, ISBN-10: 1491920491.
2. Block chain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gauar, Pearson Addition Wesley,2019, ISBN-10: 0135581354.

e-Resources:

1. https://nptel.ac.in/courses/106105235
2. https://www.coursera.org/courses?query=Block chain

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IV B.TECH	EXPLAINABLE AI	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: Machine Learning, Python.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Explain the need for XAI and critique limitations of black-box models
2. Apply interpretable ML techniques to real-world datasets
3. Design post-hoc explanations for complex models
4. Evaluate ethical/legal implications of AI systems using XAI principles
5. Develop a prototype integrating XAI methods for transparency

UNIT-I: INTRODUCTION TO EXPLAINABLE AI: Need for XAI: Bias, fairness, accountability. Black-box vs. interpretable models. Trade-offs between accuracy and interpretability.

Case Study: Healthcare diagnostics.

UNIT-II: INTERPRETABLE MACHINE LEARNING MODELS: Linear models, decision trees, rule-based systems. Feature importance. Model-agnostic vs. model-specific methods.

Lab: Implementing SHAP values for a regression model

UNIT-III: POST-HOC EXPLANATION TECHNIQUES: Local vs. global explanations. Surrogate models, counterfactual explanations. Visualizations. **Case Study:** Credit scoring systems

UNIT-IV: ETHICAL AND LEGAL ASPECTS: GDPR and right to explanation. Bias detection and mitigation. Human-in-the-loop XAI. Debate: Ethical dilemmas in autonomous vehicles.

UNIT-V: ADVANCED TOPICS: Explainability in deep learning (attention maps, Grad-CAM). XAI for reinforcement learning. Future trends: Self-explaining AI.

Project: Building an interpretable COVID-19 prediction model.

Text Books:

1. "Interpretable Machine Learning", Author: Christoph Molnar,Publisher: Leanpub, Coverage: SHAP, LIME, PDPs, model-agnostic methods (Units 2 & 3).
2. "Explainable AI: Interpreting, Explaining and Visualizing Deep Learning",Editors: Wojciech Samek et al.Publisher: Springer (2019),Coverage: XAI for DL (Grad-CAM, attention maps – , ethics.

3. "AI Ethics", Author: Mark Coeckelbergh, Publisher: MIT Press (2020),Coverage: Ethical/legal aspects (Unit 4), GDPR, bias mitigation.

References

1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", Author: Aurélien Géron, Publisher: O'Reilly (2019), Coverage: Practical implementation of interpretable models (Units 2 & 3 labs).
2. "Fairness and Machine Learning: Limitations and Opportunities", Authors: Solon Barocas et al Publisher: Fair ML Book (Free online),Coverage: Bias/fairness (Unit 4), case studies.
3. "Deep Learning Interpretability: A Medical Perspective", Author: Ayman El-Baz (Editor), Publisher: Academic Press (2021), Coverage: XAI in healthcare (Unit 1 case study).

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IV B.TECH	PROMPT ENGINEERING	L	T	P	C
I SEMESTER		3	0	0	3

Prerequisites: AI Basics

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the basics of Prompt Engineering
2. Apply the principles of Prompt Engineering.
3. Effectively use and design prompts for various artificial intelligence applications.
4. Understand the limits of prompt engineering.
5. Learn about the ethical considerations in prompt engineering

UNIT-I: INTRODUCTION TO PROMPT ENGINEERING: What is Prompt Engineering, and why do we care? English as a new programming language, Getting to know our GPT-based AI tool, The Naive Prompting Approach and the Persona Pattern, The Interview Pattern

UNIT-II: THE CHAIN-OF-THOUGHT APPROACH: The Chain-of-Thought Approach in Prompt Engineering, The Tree-of-Thought Approach in Prompt Engineering, Controlling Verbosity and the Nova System, getting to Know wats on Prompt Lab

UNIT-III: DECISION-MAKING TOOLS AND TECHNIQUES: Decision Analysis, Risk Analysis and Management, Cost-Benefit Analysis, Multi-Criteria Decision Making Design Principles in Prompt Engineering, Systems Thinking in Engineering, Design Thinking Strategies, Human-Centered Design and User Experience

UNIT-IV: UNDERSTANDING THE LIMITS OF PROMPT ENGINEERING: Recognizing when using prompt solutions is not appropriate, Identifying the limitations of prompt solutions, Analyzing the limitations of prompt solutions

UNIT-V: ETHICS IN PROMPT ENGINEERING: Understanding the ethical considerations and potential biases in prompt engineering, Best practices for ensuring fairness and accountability in prompt engineering

Text Books:

1. The Art of Prompt Engineering with Chatgpt: A Hands-On Guide by Nathan Hunter, 2023

Reference Books:

1. Prompt Engineering by Padmaraj Nidagundi, 2022
2. Prompt Engineering for Generative AI by James Phoenix, Mike Taylor, 2024

E-Resources:

1. https://www.udemy.com/course/prompt-engineering-for-ai/
2. https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/

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IV B.TECH	CONSTITUTION OF INDIA	L	T	P	C
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Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand historical background of the constitution making and its importance for building a democratic India.
2. Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
3. Understand the value of the fundamental rights and duties for becoming good citizen of India.
4. Analyze the decentralization of power between central, state and local self- government.
5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

UNIT-I: INTRODUCTION TO INDIAN CONSTITUTION: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-II: UNION GOVERNMENT AND ITS ADMINISTRATION STRUCTURE OF THE INDIAN UNION: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions.

UNIT-III: STATE GOVERNMENT AND ITS ADMINISTRATION GOVERNOR: Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions.

UNIT-IV: LOCAL ADMINISTRATION: District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayats: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT-V: ELECTION COMMISSION: Election Commission- Role of Chief Election Commissioner and Election Commissioner ate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women.

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford Univ

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